INSTITUTES

AND

PRACTICE OF SURGERY:

BEING

OUTLINES

OF

A COURSE OF LECTURES,

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Segnius irritant animos demissa per aurem,
Quam quæ sunt oculis subjecta fidelibus.—Hor.

SIXTH EDITION,

MUCH ENLARGED AND IMPROVED.

IN TWO VOLUMES.

VOL. II.

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THE INSTITUTES

PRACTICE OF SURGERY.

CHAPTER I.

DISEASES OF THE NOSE AND ANTRUM.

The subjects embraced in the first volume of this work correspond with the arrangement of the anatomical lectures in the University, so closely, that by the time the latter are disposed of, the former may be entered upon. The same correspondence, however, has not existed, hitherto, in the arrangement of the matter of the second volume. To effect this, the distribution of the text in the two last editions has been altered. If upon any occasion, then, the diseases should appear in this volume disjointed, let it be remembered that accurate collocation has been sacrificed to convenience and expediency. With these views, I commence with the diseases of the nose and antrum.

The mucous membrane which lines the cavity of each nostril, not only covers the spongy bones, but extends to the antrum maxillare, to the frontal, ethmoidal, and sphenoidal sinuses, and even to the mouth and throat. Hence a similarity of disease is found to pervade each of these parts, the foundation of which may be said to be laid, generally, by inflammation produced by cold, specific diseases, and other causes. The most common diseases of these cavities, are polypous tumours, collections of purulent matter, and ulcerations.

SECTION I.

POLYPUS OF THE NOSE.

A POLYPUS may spring from any portion of the Schneiderian membrane : it originates, however, most frequently either from the superior or inferior spongy bone. In shape it is usually pyriform—being narrow at its root and expanded below ; though this will depend very much upon the natural form of the cavity it occupies. Sometimes the base of the tumour is exceedingly broad. Not unfrequently a polypus originates high in the nose, and instead of falling forwards, or towards the anteror nares, takes a backward direction, hangs behind the palate, and sometimes reaches the pharynx. One or both nostrils may be the seat of this disease. When both are filled, the patient breathes with difficulty, and with a peculiar rattling noise. In damp weather, the tumours often project beyond the nose, and contract and disappear as soon as the weather becomes dry. The consistence of polypus is not less variable than its form. Firm, fleshy, and very solid, in some instances, it is, upon other occasions, extremely soft, and so tender as to tear upon the slightest touch. The most common variety, so far as my experience goes, is that which bears, in consistence, shape, colour and size, a striking similitude to the common oyster. Most polypi are extremely vascular, and if rudely handled, bleed profusely. No age, or sex, is exempt from the disease, which sometimes assumes a malignant form, at other times destroys the patient, by exciting, from pressure, caries of the spongy and ethmoid bones, inflammation of the brain, &c.

TREATMENT OF POLYPUS OF THE NOSE.

Several operations, very opposite in character, have been practised for the removal of nasal polypus. I prefer in most cases the use of the forceps. These, when properly made,

should be rather stouter than the common dressing forceps, with their extremities slightly curved, serrated, and a considerable slit or hole in each blade, about half an inch from its point. The patient being seated before a strong light on a low chair, with his head moderately thrown back and firmly supported by an assistant, the surgeon carefully introduces the instrument with its blades expanded, as far as the root of the tumour, takes firm hold of it, and by two or three turns of the instrument, instead of pulling in a straight line, twists it away. A copious gush of blood generally follows, especially if the tumour be partially removed. Clearing this away, the forceps are again and again introduced until the whole nostril be free, the strongest proof of which will be the freedom with which the patient can breathe or force air through the nostril. In performing this operation, great care must be taken not to use unnecessary violence, because it has sometimes happened that the ethmoid bone has been broken up and other mischief produced sufficient to lead to fatal consequences. This operation is chiefly adapted to polypi with narrow necks, and confined to the cavity of the nostril.

The operation of *excision* has been recommended by J. Bell, Whately, and others, for the removal of polypi of large size and broad base. There are very few cases, it appears to me, requiring such a measure. Independently of the difficulty of the operation, the hemorrhage is always very profuse, and besides the uncertainty of removing the whole of the disease, the surgeon will run considerable risk of injuring the sound parts in the neighbourhood of the tumour. Mr. Whately employs a sheathed knife, somewhat similar to Dr. Physick's bistoury for fistula in ano.

The *ligature*, although recommended by some writers for every variety of polypus, can seldom be employed advantageously, except where the tumour arises by a narrow neck and hangs beyond the posterior nares. In such cases, a silver or iron wire, or a piece of catgut, eighteen inches long, should be doubled so as to form a loop, and introduced into the nostril until it appears below the palate, when it should be caught by a pair of narrow forceps, and drawn towards the mouth, and the loop at the same time expanded by the fingers of the surgeon. As soon as this is accomplished, the operator, still holding the

loop with one or two fingers, draws the projecting ends of the wire with the other hand from the nostril, and thus by one simultaneous movement, carries the loop over the base of the polypus, and thence to its neck. The ends of the wire are next passed through the double cannula of Levret, and after being drawn so firmly as to constrict the neck of the polypus, are twisted upon the wings of the instrument and secured. In proportion as the wire becomes loose, from the shrinking of the tumour, its ends must be tightened every few hours until the polypus drops off, which it does sometimes so suddenly as nearly to suffocate the patient. If the surgeon should experience any difficulty, as he often does, in introducing the wire and noosing the polypus in the manner directed, he may resort with advantage to the cannula of Bellocque.

Whatever method may be practised for the removal of polypus, there are two points which must always be particularly attended to—the suppression of hemorrhage, and the removal of any portions of the tumour so situated as to elude the instruments directed against them. The first may be accomplished, generally, by cold astringent solutions thrown up the nostrils by a syringe, or if these do not succeed, by passing a catgut, to which two or three dossils of lint are secured, through the nostril and mouth. The pressure thus created, hardly ever fails to stop the flow of blood. To guard against the return of the disease, from portions of the tumour being left behind, the argentum nitratum, repeatedly applied, will be found the most effectual remedy.

Many attempts have been made, recently, to cure polypus of the nose without an operation, or simply by the introduction of astringent or stimulating articles into the nostrils—such as sulphate of zinc, strong snuff, muriated tincture of iron, solutions of alum. In oyster-like polypi, or those compared by Sir Astley Cooper to wet bladders hanging within the nose, or in simple relaxation of the Schneiderian membrane, I have known these, and various other remedies of the kind, prove more or less useful, but no permanent benefit to ensue where the polypus was large, fleshy, or solid, or was attached to the Schneiderian membrane, or spongy bones, by a broad base.

It frequently happens that cherry-stones, beans, glass beads,

pebbles, pieces of cork, and other foreign substances, are intro-
duced by children into the nostril, where they may become firmly
impacted and mistaken for polypous and other tumours. Some-
times a thickening of the Schneiderian membrane, or displace-
ment of the cartilaginous septum, is mistaken for a similar
disease. Where any doubt exists, careful examination should
be made, and if foreign bodies are detected, they can be easily
removed by a bent probe or by the urethral curette of Leroy
D'Etiolles. When the septum is displaced and nearly closes
one nostril, leaving the other unusually large, I have sometimes
succeeded by splitting it with a knife, partially, and keeping the
portion thus rendered loose, pushed, by a tent or plug, towards
the centre of the nose, until reunion has been accomplished.

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See Pott's Chirurgical Works, by Earle, vol. iii. p. 165 ; J. Bell's Principles of
Surgery, vol. iii. p. 89 ; Whately's Cases of two extraordinary Polypi removed
from the Nose, the one by Excision with a new Instrument, the other by Im-
proved Forceps, 8vo. 1805 ; Callisen's Systema Chirurgiæ Hodiernæ, vol. ii. p. 207 ;
Lassus's Pathologie Chirurgicale, tom. i. p. 528 ; Deschamps's Traité des Maladies
des Fosses Nasales, &c. ; C. Bell's Operative Surgery, vol. i. p. 208 ; Liston's
Practical Surgery, p. 281 Lond. 1839.

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SECTION II.

OZÆNA.

A TROUBLESOME ulceration of the lining membrane of the nostrils, attended with fetid discharge, and sometimes followed by destruction of the cartilage and by caries of the bones of the nose, is denominated by most modern writers ozæna. The origin of the disease is very obscure, though there is reason to believe that, in most instances, it is connected with the primary or secondary forms of syphilis. In other instances, marks of the purely scrofulous character are apparent. One of the most troublesome attendants of the disease is the accumulation of inspissated mucus, or of incrustations in the cavities of the nose. These are sometimes so considerable in quantity, as to block up entirely the passages. After the ulceration is fairly established, it not only takes possession of the cartilaginous septum, the ethmoid and spongy bones, and the other bones of the nose, but extends to the cheek. If the patient should recover after such ravages, he must for ever remain horribly deformed.

TREATMENT OF OZÆNA.

The remedies best adapted to the cure of ozæna are bark, iron, the mineral acids, muriate of lime, sarsaparilla, Fowler's solution, and antimony. When there is any suspicion of the disease having originated from syphilis, mercury alone, or conjoined with other preparations, should be employed. During the height of the inflammation, solutions of opium and of the acetate of lead, may be injected into the nostrils, or applied to the ulcerated surface on lint. Some of the mild animal oils introduced into the cavities of the nose, will also prove serviceable, by softening the incrustations and lessening pain. After the inflammation has abated, more stimulating materials may be employed, such as solutions of lunar caustic, sulphate of copper, the ointment of the red oxide of mercury, citrine ointment, &c.

Within the last eight years, *chloride of lime* has been particularly recommended, in ozæna, by Dr. Horner. The first case in which it was tried was a very inveterate one of several years' standing, large quantities of very fetid matter being constantly discharged from both nostrils, and after passing into the stomach occasioning great sickness and loss of appetite. A teaspoonful of chloride of lime was put into a wine-glass full of water; the clear solution was then injected into each nostril twice a-day, and the practice having been continued for a few weeks, a perfect cure was accomplished. Other similar instances have been reported, but time will show whether the medicine can be depended upon in the generality of cases. Fumigation with Æthiops mineral I have known in several instances to alleviate the symptoms and correct the fœtor. Creosote injections also answer the same purpose.

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On the subject of Ozæna, consult Pearson's Principles of Surgery, p. 279 ; Horner's Case of Ozæna, in American Journal, No. xi., May, 1830 ; Craighie's Case of Pereostitis with Ozæna, in Edin. Med. and Surg. Journal, for January, 1834 ; Lizar's System of Practical Surgery, p. 94, Edinburgh, 1838.

SECTION III.

LIPOMA.

HYPERTROPHY, or serous enlargement of the cellular membrane and skin of the nose, with distension of the sebaceous crypts, is seldom met with in this country, but in many parts of Europe is rather a common disease. It is more formidable in appearance than in reality, and although productive of great deformity, and disgusting from the rank and fetid effluvium emanating from the fissures and cells filled with serum and lymph, never has been known, I believe, to assume a malignant character. The appearance varies in different subjects, according to the duration and extent of the disease. In some there is a simple bulbous protuberance, rough and tuberculated on the surface; in others, one or more lobulated masses, crowded upon each other like the knobs of an artichoke, and so voluminous as to extend, in some instances, upon the cheek bones, and overhang the mouth, in the form of pendulous watery bags. In general they are so insensible as to admit of being roughly handled without causing pain. Venous trunks, knotted and distended, are conspicuously displayed over the surface of the tumours; but the arteries do not appear to be enlarged in proportion. Fifteen or twenty years sometimes elapse before the growth becomes inordinate. The causes of the disease are involved in great obscurity. Occasionally it seems to derive its origin from intemperance, gross feeding, and constitutional peculiarities.

TREATMENT OF LIPOMA.

Internal remedies, and local applications—with exception of the knife—prove of no service; and the sooner the operation is resorted to the better. There are two or three modes of doing it, but I prefer the following, having, in a few instances, suc-

ceeded, without difficulty, in restoring the form of the organ, and with much less scar than could be imagined. An incision is made along the central line of the nose as far as necessary, without injuring the tip or edges of the nostril, through the substance of the tumour, which is then seized with a forceps or double hook and elevated, by slow and cautious dissection; introducing the finger, from time to time, into the nostril, to prevent that cavity from being laid open. The opposite side is to be treated in a similar manner, and any irregularities left, trimmed off by the knife or scissors. In general, cicatrization soon commences, and although the surface for some weeks presents a glazed and polished aspect, yet in the end the new formed skin assumes a natural appearance, and the deformity is much less than might be supposed. There is sometimes a general oozing of blood, which may be stopped by external pressure, and by plugging the nostrils, but it is seldom necessary to secure by ligature many vessels. Mr. Hey, however, met with one instance, in which the patient nearly fainted from loss of blood, and another is reported by Liston, of death actually occurring from hemorrhage after an operation for lipoma by the late Sir William Blizzard.

SECTION IV.

POLYPUS OF THE ANTRUM.

Fungus, or polypus, of the antrum maxillare, is less frequently met with than abscess of that cavity—a disease already treated of in another place.* It is, however, one of the most formidable affections in surgery, and unless speedily arrested, generally proves fatal. The tumour sprouts from the lining membrane of the antrum, from what cause it is always exceedingly difficult to determine, and grows with more or less rapidity, until it fills the whole of the cavity. By this time considerable pain is experienced in the cheek and eye of the affected side, and soon after a perceptible enlargement of the face may be observed. These symptoms are, in the course of time, followed by distortion of the nose, projection of the eye, enlargement of the gums corresponding to the antrum, profuse discharges of sanious, fetid matter, and finally by protrusion of the bones of the face and alveolar processes, and, as a necessary result, by hideous deformity. In consistence, the tumour is generally firm and fleshy, sometimes soft, and in a few rare instances, osteo-sarcomatous, or even bony.

TREATMENT OF POLYPUS OF THE ANTRUM.

If, instead of temporizing, as is too common, until the disease is so advanced as to leave no reasonable hope of effecting a cure, the surgeon were always to follow the practice of the enlightened and fearless Desault, and operate at an early period, most patients, perhaps, would recover. As soon, therefore, as the nature of the tumour is ascertained, the surgeon should not only determine to remove it, but resolve to set no limits to the sacrifices it may be necessary to make. With this view, he must provide himself with several curved and angular scalpels, of unusual strength and thickness, two or three cauterizing irons, a key for pulling teeth, chisels, gouges, a mallet, &c. Every arrangement being made, the surgeon first separates, with a

* See vol. i. p. 135.

common scalpel, the cheek from the maxillary bone, by opening the patient's mouth as widely as possible, and cutting through the internal membrane. His next object should be to remove the molares teeth and their alveolar processes corresponding with the floor of the antrum. This may be done by the tooth-key, or by two or three strokes of a gouge and mallet. Having in this way exposed the cavity of the antrum and the surface of the tumour, the curved and angular knives must then be employed until every remnant of the disease is rooted out. The hemorrhage that follows the operation is sometimes extremely profuse, but may be instantly arrested, and with little pain to the patient, by one or two applications of the cautery. I have, however, performed several operations of the kind without ever being under the necessity of doing more towards stopping the flow of blood than plugging the antrum with lint or tow. If the operation prove successful, the antrum is filled in a few weeks with healthy granulations; but if the disease return, this is soon rendered evident by the reappearance and rapid growth of the fungus. To repress this, repeated applications of caustic, or the cautery, will be found necessary, or perhaps a second operation may be demanded. Sometimes the teeth and alveolar processes appear sound. In such cases, an incision should be made through the cheek from its outer surface, the anterior walls of the antrum perforated by a trephine, and the tumour removed through the opening.

Within the last few years very different operations from the one just described have been practised by Lizars, Gensoul, Liston, and others. In a small work on the diseases of the maxillary sinus, Gensoul contends, that by examination of the bones of the head, it will be seen that the superior maxillary bone is fixed to the adjoining one at three points—by its connexions with the nasal process, the os unguis, and the ethmoid bone, by the orbitar process of the molar bone, and by the opposite upper jaw, and corresponding bone of the palate. He was led to infer, therefore, that by separating the upper jaw bone from these connexions at certain points, that the patient would not only be saved considerable pain, but every chance afforded of taking away the whole disease; inasmuch as the entire bone in which it was seated, would be also removed. Gensoul's particular mode of accomplishing these purposes is said to be complicated and tedious; the operation of Liston, therefore, is generally

preferred. The following is an account of it, furnished by that distinguished operator himself. "The point of the bistoury is entered over the external angular process of the frontal bone, is carried down through the cheek to the corner of the mouth, and is guided by the fore and middle fingers of the one or other hand, as may be, placed in the cavity. A second incision made along and down to the zigoma, falls into the other. Then the knife is pushed through the integument to the nasal process of the maxilla, the cartilage of the alæ is detached from the bone, and the lip is cut through in the mesial line. The flap thus formed, is quickly dissected up, and held by an assistant; the attachment of the soft parts to the floor of the orbit, the inferior oblique muscle, the infra-orbital nerve, &c., are cut, and the contents of the cavity supported and protected by a narrow bent copper spatula. The division of the bones is now undertaken; with the cutting forceps the zigomatic arch, the junction of the os malæ and frontal bone by the transverse facial suture, and the nasal process of the superior maxilla, are cut in succession; then a notch having been cut out of the alveolar process, the palatine arch is clipped through by strong scissors placed along it, one blade in the nostril of the affected side, the other in the mouth. Then it is that an assistant will be prepared to place his fingers on the trunk of one or both carotids. The tumour is now shaken from its bed, and as it is turned down the remaining attachments are divided by the knife; the velum palati is carefully preserved, and also, if possible, the palatine plate of the palate bone. Perhaps no vessel may require ligature, the branches of the internal maxillary having been elongated, and torn from the tumour; in fact, if the mass is large, there is no possibility of reaching these vessels with the knife. The patient is now removed from the sitting posture, which is the most convenient for all parties during the operation, and laid on a couch or table. The cavity is sponged out and examined; if any vessel is seen hanging in the wound, though it does not bleed, it may be tied, and the ends of the ligature cut off. The space which was occupied by the tumour is then filled with lint, and the edges of the wound brought together by points of interrupted or twisted suture, but no dressing should be applied. After twenty-four hours, some of the sutures may be taken out, and replaced by narrow strips of plaster; and at the end of forty-eight hours, the remainder of the stitches are cut and the

needles withdrawn—the whole track of the wounds, which will in all probability have adhered, being properly supported. A large void is necessarily left in the palate, but it is wonderful how soon and completely this is repaired by the return of the bones to their original situation, and by the granulation and contraction of the soft parts."

I say nothing of the modern proposal of curing polypus of the antrum by tying the carotid, because I have reason to believe that all attempts of the kind hitherto made, (in which the ligature of that vessel was entirely depended upon,) have proved abortive. I should conceive it equally unnecessary, and not less reprehensible, first to tie the carotid, and afterwards to extirpate the tumour, inasmuch as the patient's danger must be increased tenfold, and without any adequate compensation.

Cases occur, now and then, in which *spontaneous* cures of this formidable disease are effected. Twelve or fourteen years ago, a mulatto man with a large fungus of the antrum, came to me from Petersburg, Virginia, but refused to submit to an operation, and returned home. From that period the tumour ceased to grow, and never afterwards, I have reason to believe, occasioned inconvenience. Ten years ago, a negro man from Fredericktown, Maryland, visited Philadelphia, and consulted me respecting a similar tumour of the antrum. I advised the operation, but he, also, refused to submit to it. A few months afterwards, the inflammation subsided, and eventually the tumour was *converted into bone.* It has so remained ever since, is now entirely free from pain, and the health of the patient has long been excellent.

Consult Desault's Works, by Smith, vol. i. p. 141; Desault's Parisian Chirurgical Journal, vol. i. and ii.; Traité des Maladies Chirurgicales, et des Operations qui leur Conviennent, par MM. Chopart et Desault, tom. i. p. 195; J. L. Deschamps's Traité des Maladies des Fosses Nasales et de leur Sinus; Suite d'Observations sur les Maladies des Sinus Maxillaire, par M. Bordenave, in Mémoires de l'Académie Royale de Chirurgie, tom. xiii. edit. duodecimo, p. 367; Abernethy's Account of a Singular Disease in the Upper Maxillary Sinus, in Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. ii. p. 309; Gibson on Bony Tumours, in the Philadelphia Journal of the Medical and Physical Sciences, vol. iii. p. 100; C. Bell's Surgical Observations, vol. i. p. 413; Velpeau, Nouv. Elem. de Med. Operat.; Gensoul, Lettre Chirurg. sur quelques Maladies Graves du Sinus Maxillaire, 8vo. Paris, 1833; Liston's Practical Surgery, p. 310; Lizar's Pract. Surg. p. 99, Edin. 1838.

CHAPTER II.

DISEASES OF THE MOUTH.

UNDER this head may be included several diseases, some of which have already been treated of in the preceding volume. The principal affections of the mouth, and of the parts in its immediate vicinity, are hare-lip, cancer of the lip,* cancer of the tongue,† ranula, malformation of the frænum linguæ, enlargement of the tonsils, elongation of the uvula, epulis or scirrhus of the gums, and caries of the teeth. To give even a general account of the diseases of the teeth, and of the various operations practised upon them, would alone occupy a volume. The present state of surgical science, however, and the subdivision of professional labour, would seem to obviate altogether the necessity of treating of these affections in a work of this description.

SECTION I.

LABIUM LEPORINUM, OR HARE-LIP.

THIS is a congenital deformity, and takes its name from a supposed resemblance to the lip of a hare or rabbit. There are two varieties of the disease—the single and double. The former is the most common, and is a simple fissure or slit, extending from the edge throughout the substance of the lip to a greater or less extent : the latter is comparatively rare, and differs from the single variety chiefly in having a wider opening, and an intermediate hanging portion. Both varieties are often com-

* See vol. i. p. 179.   † Ibid. p. 182.

plicated with a cleft or opening in the bones of the palate. The upper lip is, in nine cases out of ten, the seat of the disease, and the borders of the fissure are invariably rounded, and covered with the red and delicate membrane peculiar to the edges of the natural lips. Hare-lip, independently of its deformity to the infant, proves a serious inconvenience by interfering with its powers of suction, and to the adult by interrupting speech, and preventing the articulation of labial sounds. Sometimes one or more of the incisor teeth project from the upper part of the hare-lip nearly in a horizontal direction, and add very much to the deformity, besides increasing the difficulty of effecting a cure. Where there is cleft in the bony palate, it often happens that one portion of the jaw is below the level of the other, and that the most prominent portion projects so far as to create not only great deformity, but to interfere with reunion after the operation, by producing ulceration.

TREATMENT OF HARE-LIP.

The only effectual remedy for hare-lip is an operation, and the sooner this is performed the better. If the fissure in the lip is single, it will be sufficient to remove each of its rounded edges in the following way. The infant being firmly held in the arms of a nurse, or laid on a pillow with its head elevated and securely fixed by an assistant, the surgeon having previously separated the internal membrane of the mouth and its frænum, introduces between the lip and gums a narrow flat piece of wood five or six inches long. This being held by another assistant, the operator himself stretches the lip upon the board, and commencing near the nostril, makes an incision downwards, and at a single cut removes in a straight line the edge of the lip. The opposite edge is next detached in a similar manner, when the chasm left will resemble the letter V inverted. It only remains to draw the edges of the wound together, and retain them by the twisted suture, taking care to commence by passing a pin first through the hanging edge or lower portion of the lip, instead of the upper. Two or three pins will generally be sufficient. They should be passed horizontally, at regular intervals, and rather nearer the internal than the external surface of

the lip.   The close contact of the edges of the wound, and the
pressure necessarily occasioned by the tightening of the liga-
tures, are sufficient to arrest the hemorrhage.   Each pin should
be surrounded by a separate ligature passed about it in the form
of the figure 8.   In four or five days, the adhesion is usually
complete, and the pins may be withdrawn, to prevent them from
exciting ulceration.   Sir A. Cooper and some other surgeons
prefer the interrupted to the twisted suture, and Liston uses upon
all occasions common sewing needles in preference to silver
pins,—breaking off their points with nippers after the operation.

When the operation for double hare-lip is performed, it should
be conducted upon the principles just laid down.   But four in-
stead of two incisions should be made—one on each side of the
intermediate projection, which may then be dovetailed, as it
were, with the outer edges of the lip by one or two pins passed
entirely across.   The cleft in the bony palate, should it exist,
generally closes up, *sua sponte*, provided the operation be not
too long delayed.   When it is said, " the sooner the operation
is performed the better," it should not be understood that it
must be done immediately after birth.   Infants of two or three
weeks old, are very apt to die in convulsions from operations.
Four or five months after birth, will be a favourable period for
the operation, or three or four years.

See Sabatier de la Medicine Operatoire, tom. iii. p. 273, 8vo. 1810 ; Lassus's
Pathologie Chirurgicale, tom. iii. p. 451 ; Richerand's Nosographie Chirurgicale,
tom. ii. p. 255 ; Dictionnaire des Sciences Medicales, tom. iii. p. 55, article Bec
de Lievre ; Desault's Works, by Smith, vol. i. p. 148 ; B. Bell's Surgery, vol. iv.
p. 447 ; C. Bell's Operative Surgery, vol. ii. p. 38 ; Kirby's Cases in Surgery, p. 61 ;
Liston's Surgery.

SECTION II.

RANULA.

An obstruction of one or more of the ducts of the sublingual gland gives rise to the formation of a semipellucid soft tumour, denominated by the older surgeons ranula—from an imaginary resemblance to the belly of a frog. This tumour is generally filled with saliva, or with a viscid fluid resembling the white of an egg. Sometimes it attains so large a size as to interfere with speech and deglutition, and even to displace the teeth. It arises either from adhesion, or natural imperfection of the duct, or from the lodgement of a calculous concretion within its passage. Children and infants are more subject to the complaint than adults. According to Dupuytren and others, it is doubtful whether ranula is seated in the salivary ducts, or whether it consists merely in a serous cyst. Breschet found these cysts in five dissections which he made to ascertain the fact.

TREATMENT OF RANULA.

A simple evacuation of the fluid with a lancet answers no purpose, inasmuch as the opening closes again in a few hours. To effect a permanent cure the cyst must be laid open freely, or a portion of it removed with scissors. The application of caustic may afterwards become necessary. But even these operations do not always succeed. "I attended a young lady," says Professor Cooper, "who had a ranula, in which the plans of freely opening the cavity, of transfixing it with setons, of removing portions of the cyst, and of introducing into it lint wetted with a strong solution of nitrate of silver, all failed. The latter experiment caused a great deal of pain and some swelling of the glands of the neck." By puncturing the swelling, however, and keeping a small cannula in the opening for three weeks, a cure was effected. Dupuytren recommends for

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the same purpose, what he calls a " bouton à demeure."—a small contrivance consisting of two buttons, connected by a pedicle, one of which is introduced into the cyst, through a small puncture made into it, while the other remains in the mouth, and serves the purpose of draining off the fluid as soon as it is secreted.

See Lassus's Pathologie Chirurgicale, tom. i. p. 402 ; C. Bell's Operative Surgery, vol. ii. p. 24 ; Callisen's Systema Chirurgiæ Hodiernæ, vol. ii. p. 108 ; Dupuytren, Leçons Orales, tom. iii.; Malgaigne, Man. de Med. Oper.

SECTION III.

MALFORMATION OF THE FRÆNUM LINGUÆ.

It sometimes happens, though not so frequently as imagined, that children are born with the frænum of the tongue so short, as to prevent them from sucking. To ascertain whether this be really the case, the surgeon should endeavour to raise the point of the tongue with a spatula. If he should fail in this attempt, and the tongue appears upon examining it on the side to be unnaturally confined, little doubt can remain of the frænum being defective.

TREATMENT OF MALFORMATION OF THE FRÆNUM LINGUÆ.

Although the division of the frænum linguæ is usually looked upon as a trifling operation, it is one that should not be lightly performed, and upon every common occasion. Petit relates two instances, in which death followed from the frænum being so much loosened, as to permit the tongue to fall backwards into the pharynx, and suffocate the patient. Other cases are recorded of fatal hemorrhage from wounds of the ranine arteries and veins. To guard against accidents of this description, the operator should use a pair of probe-pointed scissors, and take care to direct their points downwards, and divide no more of the frænum than is absolutely necessary. Dr. Dewees, whose experience in the treatment of the diseases of infants, was equal, perhaps, to that of any practitioner living, objected to the use of scissors in the division of the frænum linguæ, and employed, instead of them, a common gum lancet. He never met with a case in which the tongue was swallowed, or of hemorrhage, from the division of the ranine arteries, or other vessels. Hence it may be fairly inferred that such accidents must be exceedingly uncommon. According to the same practitioner, there are two

causes that may give rise to an operation, the one an adventitious membrane, which pursues the natural frænum throughout its whole course, and even continues beyond the frænum, and ties the tongue so completely down, that the child cannot raise the tongue, or carry it beyond the lips—the other, an actual shortening and thickening of the proper frænum itself.

It sometimes, though rarely, happens, that the tongue immediately after birth is found glued to the roof of the mouth by mucus or lymph, and the child thereby prevented from sucking. Care should be taken not to confound this case with that of shortening of the frænum, otherwise an operation may be performed unnecessarily. All that can be required, generally, where the tongue clings temporarily to the roof of the mouth, is to separate it gently with a spatula or spoon, and afterwards to apply slightly astringent washes by a mop, until the secretion is corrected.

Hypertrophy of the tongue is occasionally met with, but instead of executing the severe operation of excision, the surgeon should follow the judicious practice first pointed out by Lassus, and recently carried into effect so successfully by Crossè of Norwich—compression, by bandages, of the tongue within the walls of the mouth.

See Petit's Traité des Maladies Chirurgicale, tom. iii. p. 260; Lassus's Pathol. Chirurg.; Burns's Surgical Anatomy of the Head and Neck, p. 261; C. Bell's Operative Surgery, vol. ii. p. 28; Velpeau, Nouv. Elem. de Med. Oper.; Malgaigne, Man. de Med. Operat.

SECTION IV.

ENLARGED TONSILS.

ENLARGEMENT of the tonsils is very common among scrofulous children, and arises from exposure or frequent attacks of catarrh and sore throat. Sometimes, however, the disease is slowly induced without being preceded by pain, swelling, or any of the characteristics of acute inflammation. If suffered to remain for any length of time, the tumours occasionally attain so large a size as to interfere materially with respiration and deglutition. Persons troubled with this disease, have a peculiar hoarse, husky, or croaking voice, and when labouring under cold, wheeze excessively.

TREATMENT OF ENLARGED TONSILS.

The *knife* and *ligature* have been frequently employed in the removal of enlarged tonsils. To the latter the preference is usually given, inasmuch as there is no risk of hemorrhage, a consequence sometimes apt to follow the use of the knife, even when employed with the utmost caution. Formerly the ligature was suffered to remain upon the enlarged gland for several days, or indeed until the tumour sloughed away, and from this practice great irritation about the fauces, tongue, and mouth, ensued. To obviate these inconveniences, Dr. Physick first suggested the following mode of practice. The operator takes a double cannula, about four inches long, and passes through it, doubled, a piece of soft, flexible iron wire, one twenty-fourth part of an inch in diameter, secures one end of the wire to an arm of the cannula, and permits the other end to project about five or six inches beyond the opposite barrel of the instrument. The cannula being thus armed, the loop of wire is spread out to a sufficient extent to pass over the tumour, and is bent a little

to one side, that it may with the greater facility approach its base. An assistant holds down the patient's tongue with the handle of a large spoon, while the operator conveys the wire over the base of the tumour, and taking hold of its projecting end draws it loosely, in order to ascertain whether it is properly fixed. Finding this to be the case, and that the uvula is not included, the end of the wire is then seized with a pair of flat pliers, drawn as firmly as possible, and secured by wrapping it around the remaining arm of the cannula. The wire, thus applied, should be permitted to remain on the tonsil *twenty-four hours*, and then disengaged in the following way. The cannula being firmly held with one hand, the other is employed in loosening the end of the wire from the arm of the instrument; having accomplished which, the surgeon straightens the wire with the pliers, and pushes it backwards until it is removed from the tonsil. In a few days the tumour drops off entire, or in fragments, and the ulcer left, heals without difficulty.

For several years the late Dr. Physick pursued the above practice; but experience taught him that although the operation, thus modified, was free, in a measure, from the inconveniences of the old method of using the wire, there were yet objections to the practice which he had not anticipated. In particular, he found that, in some instances, profuse ptyalism, swelling of the throat, difficulty of breathing and swallowing, (sometimes followed by ulceration of the soft palate and fauces,) were induced. Of late years, therefore, he has abandoned the ligature, in toto, and employed the knife. The instrument he uses was originally invented by him for truncating the uvula. "In the operation for cutting off the uvula, Dr. Physick has, until very lately, used scissors; but being unable to complete the operation by one application of that instrument, several have been necessary to effect the division of the part. To obviate this difficulty, he determined to try the old instrument, as modified and represented by Benjamin Bell, in his System of Surgery. He found, however, that although he could divide with that instrument the greater part of the uvula, a portion of the membrane that covers the back part of it was not always divided, making the use of the scissors necessary to cut it through. To remedy this inconvenience, he caused an instrument to be made having two plates instead of one, between which the knife was passed; but still the same dif-

ficulty was experienced in cutting through the membrane on its posterior part. He then thought of wrapping a strip of waxed linen over the semicircumference of the opening, to support the membrane until it should be divided by the knife. Thus constructed, the instrument answered the purpose completely, and cut through the whole substance of the part in an instant. Dr. Physick has since used an instrument of similar construction for the removal of scirrhous tonsils. He finds it easy to cut off the whole, or any portion that may be necessary, of the enlarged tonsil in this manner. The operation can be finished in a moment of time. The pain is very little, and the hemorrhage so moderate that it has not required any attention in four cases, in which he has lately performed it. The size of the perforated end of the two plates, and of course that of the knife, must be larger in the instrument for extirpation of the tonsils, than in that for truncation of the uvula."* The construction of this instrument will be better understood by examination of Plate I. fig. 1 and 2. In a subsequent account of Dr. Physick's instrument, it is remarked, that, " occasionally there is some difficulty in passing the circular aperture in the extremity of the two plates completely and speedily over the tonsil to its base. In such cases the operation may be much facilitated, by using a forceps with a lunated extremity, to which teeth are adapted, invented by Dr. Physick, by means of which the tonsils may be seized and drawn through the aperture to any distance that may be deemed proper, when its extirpation can be immediately effected. It may not, however, be improper to observe that, under ordinary circumstances, the aid of the forceps is altogether unnecessary. The forceps is about seven inches long, curved near its extremity, which is lunated and armed with teeth."† (See Plate II.)

Having experienced more or less difficulty in the removal of enlarged tonsils—owing, chiefly, to the number of instruments, such as spoons, hooks, forceps, &c., required—it occurred to me that an instrument might be contrived that would answer the purpose of all these—by keeping down the tongue, holding the gland firmly, and separating it nearly at the same moment. Such I accordingly projected, and ordered made, and upon trial

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* American Journal of Med. Sciences, Feb. 1828.   † Ibid. May, 1828.

found to answer my most sanguine expectations. For several years past I have used it, in a number of instances, and have seen it used by others, and can, therefore, speak of it decisively. It consists of a pair of forceps nine inches long, the eighth of an inch thick, half an inch broad, when shut, with extremities an inch and a half long, slightly serrated and somewhat curved, including, when closed, an oval space half an inch wide, and terminating, at the other extremity, in handles which stand off obliquely from the shafts of the instrument. A knife, or blade, the length, and breadth of the forceps, rounded on its cutting edge, and having a button placed perpendicularly to its axis on the opposite extremity, works backwards and forwards by means of a groove, to the extent of an inch and upwards, between the blades of the forceps, to one of which it is secured by screws. A sheath upon each end of the forceps, to keep the knife from starting off the moment it touches the tumour, completes the instrument.*   (See Plate I. fig. 3.)

To apply the instrument properly, it will only be necessary to introduce it into the patient's mouth with the blades closed and resting flat upon the tongue, which is thus kept depressed. The instrument is then turned on its edge, still resting on the tongue, its blades expanded, placed fairly around, and completely *behind* the tumour, which is then seized, and firmly held, while the thumb, resting on the button-like extremity of the knife, pushes it forwards and instantly separates the enlarged tonsil, which is immediately brought away in the grasp of the forceps. To prevent any portion from being left, or the tumour from hanging by a narrow neck, the surgeon should see that the knife reaches to the very extremity of the forceps, and should be sure that the whole of the tumour is fairly within the grasp of the instrument. The instrument may be applied indifferently to either tonsil—care being taken always to place the surface of the forceps on which the *knife* rests to the base of the tumour. The instrument-makers, generally, do not make this instrument sufficiently wide and round between the jaws, and hence difficulties are occasionally met with by inexperienced operators.

An immense number of instruments have been invented in

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* This instrument, as well as Dr. Physick's for the same purpose, was manufactured by Mr. H. Schively.

Plate II. Vol. 2.
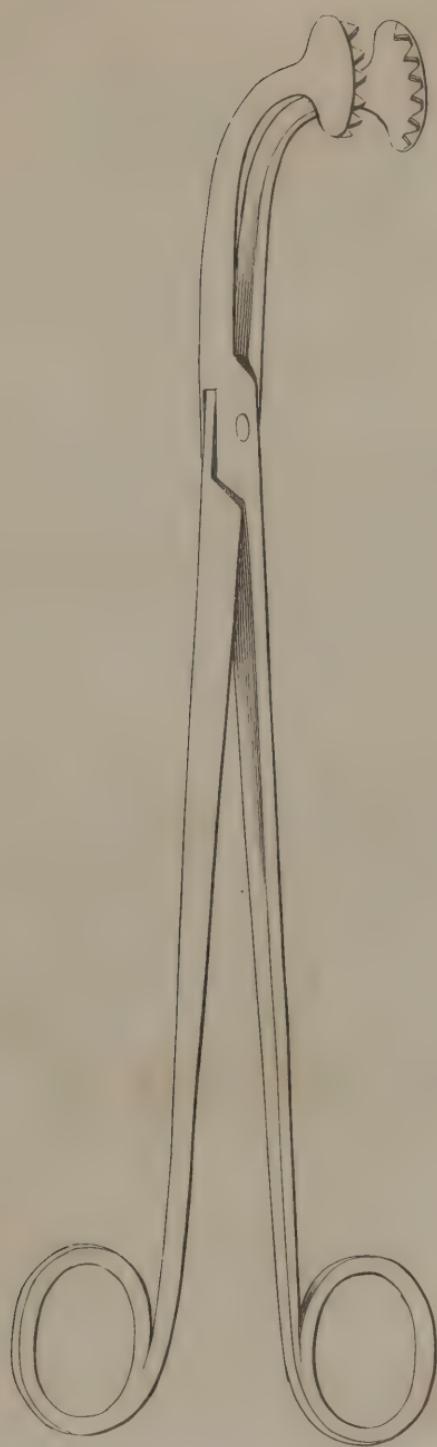
this and other countries, for the removal of enlarged tonsils, and it would be almost impossible to describe half of them. Hosack, Stevens, and Cox, of New York, and Fahnestock, of Bordentown, have each described particular kinds. Fahnestock's instrument, as it is called, was first devised by myself, as the model of it, still in the possession of Mr. Schively, will show. I abandoned it, however, from finding extreme difficulty in renewing the cutting edge. My friend, Dr. A. E. Hosack, may be said to have been the first in this country to recommend cutting instruments for the removal of tonsils.

Profuse hemorrhage sometimes follows the excision of the tonsils. The surgeon, aware of the possibility of this, should take care not to apply the knife too near the base of the tumour. More than twenty years ago, I cut off an enlarged tonsil with scissors from a medical student, now a respectable practitioner at Bedford, Pennsylvania, and had great difficulty in preventing the hemorrhage from terminating fatally. Wiseman and Moscati point out danger from another source—the falling of the tonsil backwards, when partially cut, upon the rima glottidis—and relate cases of suffocation from that cause.

See Desault's Works, by Smith, vol. i. p. 193; Sharp's Treatise on the Operations of Surgery, p. 199, 9th edit.; Chevalier's New Mode of Tying Diseased Tonsils, in vol. iii. p. 79, Medico-Chirurgical Transactions; Dorsey's Surgery, vol. i. p. 422; The Double Cannula and a Wire, recommended in the Operation of Extirpating Scirrhous Tonsils and Hemorrhoidal Tumours, by Philip Syng Physick, M. D., in vol. i. p. 17 of the Philadelphia Journal of the Medical and Physical Sciences; Case of Obstinate Cough, occasioned by Elongation of the Uvula, in which a portion of that organ was cut off, with a Description of the Instrument employed for that purpose, and also for Excision of Scirrhous Tonsils, by Philip Syng Physick, M. D., Professor of Anatomy in the University of Pennsylvania, in Journal of Medical Sciences for 1828; Description of a Forceps employed to facilitate the Extirpation of the Tonsil, and invented by P. S. Physick, M. D., ibid. 1828; A. E. Hosack, in Philadelphia Med. Journ. vol. vi.

SECTION V.

ELONGATION OF THE UVULA.

THE uvula, from colds or other causes, is frequently enlarged or elongated.   If it continues so for any length of time, troublesome irritation about the epiglottis, nausea, vomiting, and even hæmoptysis and phthisis pulmonalis may be induced.

TREATMENT OF ELONGATION OF THE UVULA.

To obviate some of these consequences, an operation has been practised from time immemorial—the excision or amputation of the uvula.   This may sometimes be performed by a hook and common scissors, or by the particular scissors described and engraved by Professor Cooper, in his " First Lines of the Practice of Surgery."*   These are so contrived, as, by means of a transverse projection from one of the blades, to support the uvula, and keep it from falling backwards at the moment the operator attempts to divide it.   Even with this instrument, however, the operator is extremely apt to fail, or else divide a part only of the uvula, which is immediately drawn upwards, and lodged behind the velum in such a way as to render it difficult afterwards to remove it.   It will be better, therefore, to resort to the late Dr. Physick's instrument for the removal of the tonsils, or to the one I have recommended for the same purpose.   The instrument, however, should be made smaller for the uvula than the tonsil.   Latterly, I have succeeded very well by seizing the uvula with Liston's artery forceps, and cutting it off with a pair of common scissors.

Mr. Benjamin Bell states that he has known very profuse hemorrhage to follow amputation of the uvula.   I have very often performed the operation, but never met with an accident of the kind.

* Vol. i. p. 526, 4th edit.

The real importance of amputation of the uvula has only been estimated of late years, and it remained for Dr. Physick to point out the cases to which it was peculiarly adapted. He had met with several instances of troublesome cough, followed by emaciation of the whole body, sometimes by hemorrhage from the lungs, and eventually phthisis pulmonalis, which were produced apparently by elongation of the uvula. This determined him to try the effect of an operation in the early stages of the disease, and the result was favourable in the extreme—the cough and other urgent symptoms disappearing almost immediately, and the patients recovering perfectly in a very short time. From experience I can speak confidently of the value of the remedy, and have reason to believe that it seldom fails unless too long delayed.

By many this operation has lately been condemned as useless and unnecessary, but I still hold the opinion expressed above, and could relate a great many cases in proof of the correctness of it. The disease generally requiring the operation, is, for the most part, met with among clergymen—but why, it is very difficult to say. There is an analogous affection about the palate and pharynx, in shape of ulceration, of which I shall speak under the head of Ulceration of the Glottis.

SECTION VI.

FISSURE OF THE PALATE.

A DEFICIENCY of the soft palate, or rather a division of it, either conjoined with, or independent of, a cleft in the palate bones, is a congenital malformation, almost as common as that of hare-lip, with which, indeed, it is not unfrequently associated. Like hare-lip, too, it not only, during infancy, interferes with the suction of the child, but in after life impedes deglutition, and in many instances renders articulation nearly unintelligible. Many patients, indeed, fall a sacrifice to the disease, from extraneous matters getting into the windpipe, and bronchiæ, and laying the foundation of pulmonary affections. At other times, the patient suffers extremely from fluids, and even solids, being thrown from the stomach, or mouth, into the nares, where they excite sneezing, great irritation, and even ulceration.

TREATMENT OF FISSURE OF THE PALATE.

Although surgeons had long been acquainted with the existence and nature of malformation of the palate, few, if any, attempts were made to obviate the deformity, until Roux, the eminent Parisian surgeon, drew the attention of the profession to an operation which he denominated *Staphyloraphy*, and by which he had succeeded in *reuniting* the edges of the soft palate in twelve cases. These cases were published in 1825. Since that period, Roux has performed, with more or less success, the operation *fifty-one times.* Out of this number, but one case has been followed by death.*   It occurred in a young female, who, on the evening of the operation, was seized with inflammation of the throat, and, subsequently, with that of the

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* Lancette Française, 1830.

chest, and died on the eighth day. Roux's operations were soon followed by those of Græfe, Dïeffenbach, and others, on the continent of Europe, by Alcock, in Britain, and, subsequently, by Warren, Stevens, Mettauer, and Hosack of our own country.

The first case upon which Roux performed his operation, was that of a Canadian student, attending lectures in Paris. Before cutting away the edges of the soft palate, as in hare-lip, Roux determined to introduce three stout ligatures into the border of the palate, and at regular distances from each other. To accomplish this, he employed a small, curved needle, fixed in the *porte-aiguille ;* passed it through the palate about a quarter of an inch from its edge, then seized its point with the common dressing forceps, and drew it, together with the ligature, forward. In like manner the other ligatures were introduced, always carrying the needle from behind forwards. The edge of the palate was then cut away by the knife and curved scissors, to the extent of a line in thickness. The same operation having been performed on the opposite side of the palate, the edges of the wound were approximated by drawing each interrupted suture, tying it, and then cutting off the ends of all the ligatures. To prevent the first knot from slipping, it was held by a pair of forceps, called *pince à anneaux*, until the second knot could be secured. The patient was kept on low diet, and not permitted to speak. At the end of the third day, the two upper ligatures were removed, and, on the fourth day, the remaining ligature. Lest the reunion, which had taken place throughout each edge, might be endangered, the patient was not permitted to speak until the *eighth* day. By that time, however, the adhesion was complete, the cicatrix firm, and the deformity, with all its inconveniences, namely, imperfect articulation, difficult deglutition, &c., completely removed. Roux's object, in *first* inserting the ligatures, and *subsequently* paring the edges of the palate, was to prevent the hemorrhage from interfering with the operation by obstructing the view of the parts.

Professor Warren, of Boston, was the first to perform, there is reason to believe, staphyloraphy in the United States. The ligatures were introduced by an instrument, apparently very simple, resembling a common dissecting hook in form, with an eye near its extremity, through which passed a triple thread of strong silk. " The palate was pierced by the hook at one-

third of the length of the fissure from the upper angle of the
wound, so as to include about three lines of the edge of the soft
palate.   The eye, with the ligature, being seen, the latter was
seized with a common hook, and drawn out.   The eyed-hook
was then drawn back, turned behind the palate, and the other
edge transfixed in a similar manner."   Two other stitches were
made in a similar way, the edges of the palate drawn together,
and the knots tied without difficulty with the fingers.   Unlike
Roux's operation, the edges of the palate were cut away by
a bistoury previous to the introduction of the ligatures.   The
patient recovered perfectly, and in a short time.   In a second
operation of the kind, performed by Dr. Warren on a boy during
the prevalence of influenza, the inflammation, owing to that
disease, was so high as to require the ligatures to be removed.
The operation consequently failed, although adhesion had taken
place, but was afterwards destroyed by the fingers of the boy,
in attempting to relieve his cough.   Dr. Warren has improved,
subsequently, his instrument, by making the *point removeable,* so
that the ligature and point can be drawn out together.

   The operation of staphyloraphy was performed by Dr. Stevens
of New York, in 1826.   The ligatures were introduced by a
curved needle, attached to a handle by means of a screw, and
the edges of the velum supported by forceps, afterwards dis-
sected away by a cataract knife.   Reunion speedily took place,
and by the tenth day the patient returned home with the voice
much improved, but not so perfectly restored as in some of the
cases reported by Roux.

   In 1830, an ingenious instrument was contrived by Dr. J. B.
Mettauer, an eminent surgeon of Prince Edward, Virginia,
apparently well calculated to answer the purpose for which it
was designed, an account of which I regret I am unable, for
want of space, to introduce here, but which is fully described
and figured in an interesting memoir on staphyloraphy, published
by Dr. Mettauer, in the American Journal of Medical Sciences
for 1838.

   But my friend, Dr. Alexander E. Hosack, of New York, an
excellent surgeon, has paid as much attention, perhaps, to
staphyloraphy as any one else in the United States.   In a
memoir by him on the subject, published in 1833, at the request
of the Medical Society of the City and County of New York,

interesting observations are made, cases reported, and inge-
nious instruments invented by himself, described, which ought
to be familiar to every one before undertaking one of the most
difficult operations in surgery. Under these impressions I shall
insert a short account of Dr. Hosack's instruments, which, to-
gether with the plate and explanation of them, cannot fail, I
hope, to render them perfectly intelligible.

" It occurred to me," says Dr. H., " that as the greatest diffi-
culty and delay were experienced in the passing of the ligatures,
—arising both from the irritability and constant motion in the
palate, as well as the unavoidable disposition to swallow,—an
instrument might be constructed, calculated to lessen the incon-
venience, as well as shorten the time. I consequently caused
one to be made, as represented in the plate, and which I have
since improved, and find perfectly to surmount the objections.
In the application of this instrument, the surgeon is enabled to fix
his eye on the part through which the ligature is to pass ; the
palate is at the same time, and with the same instrument firmly
held, so as to avoid displacement, by any involuntary motion that
may occur. The time required for passing each needle is but
an instant, and it can always be accomplished with the greatest
accuracy, as regards the relative distances, as well from the
borders as from each other. This point being determined, I
directed my attention to the second step of the operation, which
is properly that of excision. The straight bistoury, and the
ordinary angular scissors, are as yet the only instruments used
for that purpose. In offering objections to them, I trust I may
escape being censured for a great desire of finding fault, as well
as from any unreasonable prejudice, in favour of invention. Hav-
ing performed the operation, I feel myself at liberty to suggest an
alteration in the scissors, which, while it embraces all the advan-
tages possessed by the above instrument, offers facilities to the sur-
geon. He is at once enabled to follow with his eye every move-
ment of the blades, until the borders are entirely separated, and
thereby control the extent and amount of substances to be re-
moved. Two scissors will be required—one for either side, six
inches in length. When viewed in profile, their form inclines to
that of the letter f. The blades form the junction to the point,
and curved laterally and forwards, so as very much to resemble
the beak of an eagle, or any other bird of that class, and which,

when applied to the palate, adapt themselves to the arched sides of the cleft. No. 1, represents a front view of the instrument for passing the needle. A, the hollow shaft with the curved extremity. B, an aperture, through which the eye is to direct the head of the needle into the thimble. C, the rod drawn out, with the chain, and thimble-like extremity attached to it. D, the bayonet fixture, adjusted upon the shaft, with the forceps for receiving the needle. E, a profile view of the forceps holding the needle. F, the rings for receiving the first and second fingers of the right hand. G, the guard upon which the thumb of the same hand is to rest. H, the wheel, or the part of the bayonet fixture, by which its motions are controlled. The index finger of the left hand is to be placed upon it; by which means it is turned, until brought opposite to the crook in which the needle is concealed; it is then to be pushed quite up, holding the palate between. The thumb of the right hand is at that moment to glide through the guard upon the button of the rod, which is to be thrust forward, driving the needle, armed with the ligature, into the forceps; the bayonet fixture is then drawn back and turned off, carrying the needle with it. No. 2, a profile view of the same, in the act of receiving the needle." (See Plate III.)

On the 9th of December, 1840, I had occasion to perform the operation of staphyloraphy, at the Philadelphia Hospital, upon a patient named Merrill, about thirty-five years of age. The fissure in the palate was a very extensive one, and so interfered with the patient's speech and deglutition as to render him very anxious for relief. In the presence of the class, in the large operating theatre, and on a day rather dark and cloudy, I accordingly undertook what would have proved extremely difficult, even with the best light, and in the presence of only two or three persons. I commenced by seizing, with Liston's artery forceps, one hanging edge of the palate, and, by a long, narrow knife, cut it off to the extent of the eighth of an inch along the whole border. The opposite edge being removed in like manner, and the bleeding suffered to stop, I passed in succession, though not without great difficulty and repeated failures, three stitches through each border of the palate, and drew the edges together so as to close the opening. The ligatures were conveyed by crooked needles fixed in Physick's forceps for deep-seated arteries, were pushed from before backwards, and drawn

Plate III. Vol. 2.

No. 2.

No. 1.

G

F   F

H   H

E

A

D

B

C
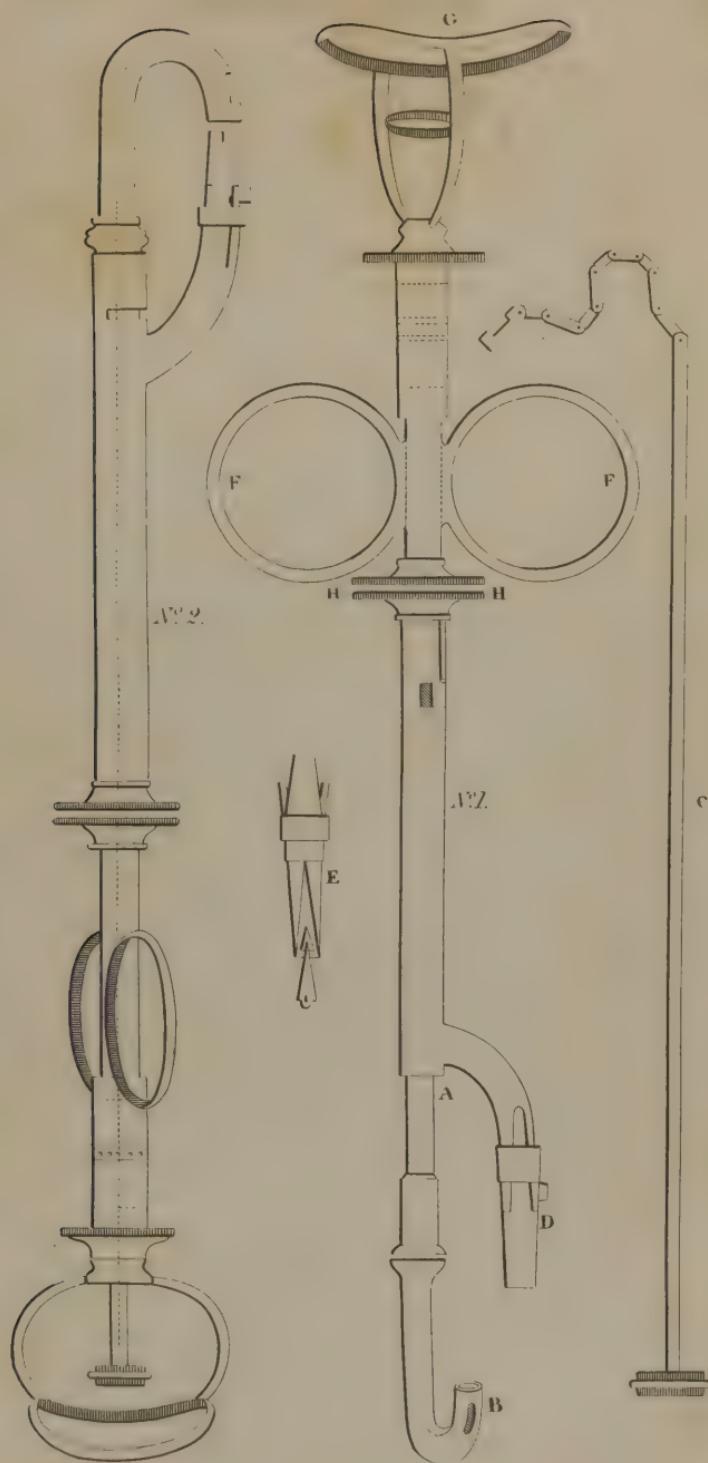
forwards, by seizing their points with a pair of dressing forceps. During these attempts several of the needles were broken at or near the eye, or became bent, so as to render it extremely difficult, during the gagging and struggles of the patient—who was, in a measure, idiotic—for me to accomplish my purpose, which, indeed, was not effected until after the lapse of a long time, and with more exertion than would have been necessary for almost any other operation in surgery—the efforts alone to keep down the tongue being sufficient to try the strength of a common man. In the course of a week the stitches all came away, and the edges of the wound were found perfectly united, with the exception of the upper part of the palate, in which an opening was left not quite half an inch long and a quarter of an inch wide. Two or three weeks were suffered to elapse, in hopes of this opening, also, closing by granulations from the opposite edges of the palate, to promote which, touches of lunar caustic were occasionally resorted to, but without effect.

Reflecting upon the trials I had encountered in the operation, and finding them mainly owing to the difficulty of seeing the points of the needles, obscured as they were by the blood, depth, and darkness of the cavity behind the palate, and the motion and resistance of the tongue, as well as the struggles and movements of the patient, who was apprehensive of suffocation, it occurred to me that instruments might be contrived to answer the different purposes required, more simple than those hitherto employed, and calculated to serve for the different stages, without being multiplied to any extent. I accordingly turned my attention to these points, and assisted by a young and ingenious cutler, Mr. Charles Schively, have succeeded, I believe, not only in constructing such as are likely to answer in all cases of the kind, but in enabling the surgeon to pass the needles and draw out the ligatures almost as well in the dark as by the best light.

The whole apparatus consists of—1st. A moveable spatula, or glossocatochus, for keeping down the tongue. (See Plate IV. fig. 1.) 2d. Of a forceps six inches long, having two blades moveable on and separable from each other, with their extremities turned up at a right angle to the extent of an inch—(fig. 2); of two long, narrow knives, one double-edged and sharp pointed,

the other probe pointed—(fig. 3 and 4); and of a pair of long handled scissors, with blades set off at an obtuse angle—(fig. 5).

The idea of the tongue spatula, I had derived partly from an instrument of the kind I had seen in the possession of Sir Philip Crampton, of Dublin, consisting of a *moveable* plate of silver or other metal, an inch and a half long, an inch and a quarter wide, and fixed upon the extremity of a handle seven inches long, arched near the plate to clear the teeth, so that being held like a spoon by the hand of the surgeon or assistant, every attempt on the part of the patient to move the tongue was frustrated by the mobility of the plate, and the close suction between it and the organ it compressed. The forceps I contrived for the twofold purpose of seizing and holding fast the edge of the palate while the knife was passing through it, and for conveying afterwards the ligatures. The first object will easily be understood from the slightest inspection of the drawing; the second it will be more difficult to comprehend. Let it be observed, however, that at the top of the angular extremity of the lower blade of the forceps a short round needle having a shoulder near its point is fixed—(fig. 6); that point being directed towards the handle of the instrument, and intended to be passed through the opening of a spring attached to the corresponding angular extremity of the upper blade,—(fig. 7). A single ligature being attached by a knot to the eye of the needle, which has a deep socket to receive it, is carried behind the angular extremity of the lower blade, and held there by the left hand of the operator, while the right hand carries the whole instrument into the mouth, hooks the needle from behind forwards, through the edge of the palate, and then, pushing the upper or moveable blade forwards, its shoulder becomes fixed in the spring; when it only remains to disengage the upper blade from the under, and drawing it out from the mouth, the end of the ligature and needle must necessarily come with it. To accomplish the removal and fixture at pleasure, of the two plates, a peculiar arrangement, by screws and corresponding openings, has been contrived upon a principle easily understood. The ligatures being introduced separately into each edge of the palate, and as many as may be deemed necessary, it only remains to draw them together and close the opening. Leaden ligatures, preferred by Græfe, and some others, may, if required, be used with equal facility.

Plate II.Vol 2

Fig.1.
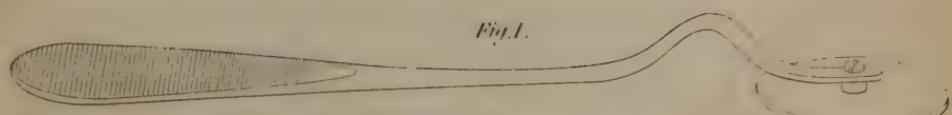
Fig.2.
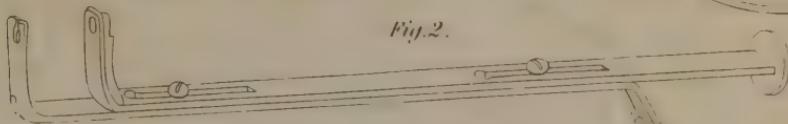
Fig.3.
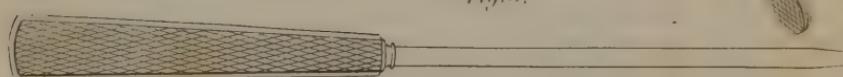
Fig.4.
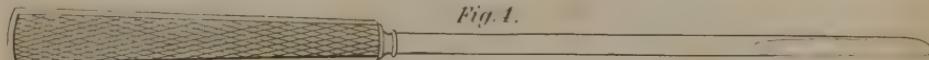
Fig.5.
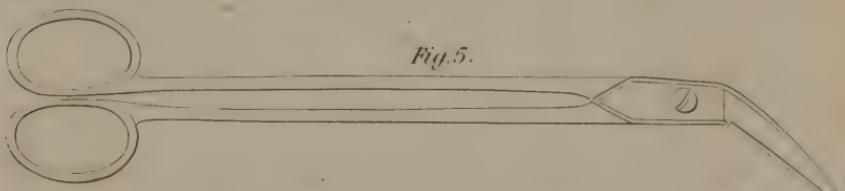
Fig.6.
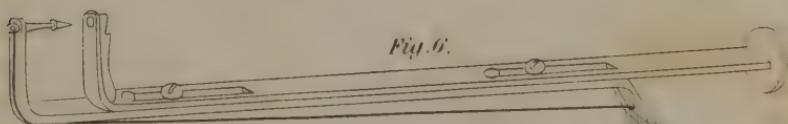
Fig 7
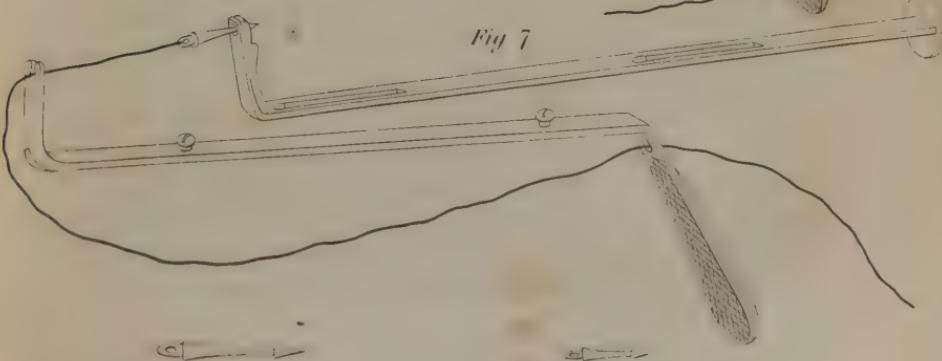
In a trial I made with the above instrument upon Merrill, with a view of closing the opening at the upper part of his palate, already spoken of, little or no difficulty was experienced, except such as arose from the ungovernable state of the patient's mind at the time, and which afterwards caused him to tear out the stitches, and escape from the hospital. I was struck with one circumstance in his case, ten days after the first operation, which I do not remember to have seen recorded—a thickening of nearly half an inch of the palate from inflammation.

An interesting case of extensive *wound of the soft palate*, cured by drawing together with sutures the divided edges, is reported in the tenth volume of the American Journal, 1832, by Dr. Wells, of Columbia, South Carolina. "A lad, aged five years," says Dr. Wells, " was running with one end of a piece of reed cane, a foot long, and about an inch in diameter, and square across at the extremities, in his mouth. He fell forward; the end of the cane coming in contact with the ground, it was thrust violently into his throat. I saw him very soon after the accident happened. There were two lacerated incisions, extending from the centre of the back part of the bony arch of the mouth backwards and outwards on each side, something more than an inch, and terminating within less than half an inch of the inferior margin of the velum palati. The soft parts were cut, or torn through, making a triangular flap, the apex of which had fallen forwards or downwards, and hung dangling upon the root of the tongue, leaving the posterior nares and pharynx fully exposed. There was considerable hemorrhage, and the child and his friends were extremely alarmed. A short common surgeon's needle was heated in the flame of a lamp, bent to a proper curve, armed with a ligature, and confined in Dr. Physick's forceps for taking up deep-seated arteries. The patient was placed upon a table and held by assistants. The mouth was kept open by a large cork placed between the back teeth, and his tongue depressed with a spatula. The needle was passed through the apex of the flap, and then through a corresponding portion of the mucous membrane, and cellular substance on the roof of the mouth, and the ligatures tied by the common stems for such operations when the fingers have not access. It was not attempted to insert more than one suture, although this did not bring the parts into exact contact; but the swelling which

supervened in the course of a few hours, as was anticipated, fully obviated that difficulty. He was kept as quiet as possible —not allowed to swallow any thing for the first four days, except a little milk and toast-water, and then as seldom as practicable. At the end of this period, adhesion was found to have taken place at every point. There is not the slightest deformity of the parts remaining. There was considerable difficulty in this little operation, from the struggles of the patient and the contracted space left for us to act in—the mouth being already pretty well occupied by the apparatus for keeping it open and depressing the tongue; indeed, without the above instruments, or others equivalent, it would have been found impracticable either to pass the ligature or to tie it." Upon the whole, I may remark, that staphyloraphy seldom succeeds perfectly, and of this the surgeon should be aware.

On Staphyloraphy, consult Memoire sur la Staphyloraphie, ou Suture du voile, du Palais, par Phil. Jos. Roux, Paris, 1825; On an Operation for the Cure of natural Fissure of the soft Palate, by John C. Warren, M. D., Professor of Anatomy and Surgery, in the Medical Institution of Harvard University, in American Journal of Medical Sciences, vol. iii. 1828; Staphyloraphy, or Palate Suture, successfully performed, by A. H. Stevens, M. D., Professor of Surgery in the College of Physicians and Surgeons, New York, in North American Medical and Surgical Journal, vol. iii. p. 233, 1827; A Memoir upon Staphyloraphy, with Cases and a Description of the Instruments requisite for the Operation, by Alexander E. Hosack, M. D., one of the Surgeons of the Marine Hospital, New York, 1833; Liston's Practical Surgery; Lizar's, ditto, article Velu-Synthesis; On Staphyloraphy, by J. P. Mettauer, in Amer. Jour. of Med. Sciences, No. xlii. Feb. 1838.

SECTION VII.

EPULIS, OR TUBERCLE OF THE GUMS.

THIS disease, like polypus of the antrum, sometimes assumes a malignant form, and involving the teeth and adjoining parts, is soon beyond the reach of surgery. This will show the propriety of attending, in the commencement, to every small tumour about the gums, however harmless may be its appearance.

Any one, indeed, who will peruse the melancholy but instructive cases detailed by Messrs. John and Charles Bell, the only writers who appear to have taken a deep interest in the subject, will need no further proof of the importance of the disease.

Epulis generally sprouts from the sockets of the incisor teeth of the upper or lower jaw. The teeth themselves are frequently sound and perfectly white, and in many instances long before the tumour is perceptible, are loosened and carried above the range of the adjoining teeth. In other cases, a small seed-like excrescence is seated upon the gum between the teeth. This remains stationary for months together, or grows so slowly, and is attended with so little inconvenience, as scarcely to attract the patient's attention. At last it loses its hard and solid feel and gristly appearance, becomes soft and rugged on the surface, bleeds upon the slightest touch, and throws out a prolific fungus. After this, no bounds are set to the increase of the tumour, the teeth are successively displaced, the lymphatic glands and other soft parts in the neighbourhood contaminated, the mouth filled with a mass of disease so large as to embarrass the breathing and swallowing, the texture of the bones of the face or lower jaw broken up, and the patient eventually destroyed by hemorrhage, suffocation or irritation.

TREATMENT OF EPULIS.

Extirpation of this tumour, in its very incipiency, is the only remedy likely to effect a permanent cure. In performing this operation the surgeon will find it necessary to provide himself with forceps and other instruments, for pulling teeth, one or two short and very strong scalpels, two or three fine watch-spring saws, tenacula, sponges, a vial of the muriated tincture of iron, lint, &c. If there is strong evidence of the tumour having originated deep among the sockets of the teeth or in the cells of the bone, the teeth surrounded by the tumour, however perfect they may appear to be, must be sacrificed, and not only the teeth, but the alveolar processes also. The cut in this case should be made with one of the fine saws perpendicularly through the bone on each side of the tumour. By these means it will be so loosened as to be easily detached with a pair of Liston's cutting forceps. The hemorrhage that follows is commonly very profuse, but may be speedily arrested by dipping a piece of lint in the muriated tincture of iron, and thrusting it to the bottom of the wound—placing above the lint a bit of cork or some elastic substance to support the lint,—closing the patient's jaws, and securing them by a bandage. In twenty-four or thirty-six hours the lint may be removed, and if necessary the application of the muriated tincture renewed at each succeeding dressing ; or the lunar or vegetable caustics may, with the same view, be applied. By adopting this plan,—the one suggested and practised by Sir Charles Bell,—I have in several operations of the kind succeeded perfectly. In other instances, where I have merely removed the tumour with the knife and caustic, it has invariably returned.

See John Bell's Principles of Surgery, vol. iii. p. 178 ; Charles Bell's Surgical Observations, being a Quarterly Report of Cases in Surgery, vol. i. p. 413 ; Gibson on Bony Tumours, in the Philadelphia Journal of Medical and Physical Sciences, vol. ii. p. 145 ; Liston's Practical Surgery, London, 1839.

CHAPTER III.

DISEASES OF THE NECK.

THE importance of the diseases of the neck can be fairly esti-
mated only by those who possess an accurate knowledge of the
structure and functions of its numerous and complicated organs.
The student should use, therefore, in prosecuting his anatomical
investigations of these parts, more than ordinary diligence. Be-
sides the great blood-vessels and nerves of the neck, the pharynx,
œsophagus, larynx, trachea, and thyroid gland are subject to
accidents and diseases of the most pressing and grievous nature.
Wounds of these different parts have already been considered ;*
but it still remains to treat of several other affections. These
are the lodgement of foreign bodies in the pharynx and œso-
phagus, foreign bodies in the larynx and trachea, ulceration of
the glottis, bronchocele, wry-neck, &c.

SECTION I.

EXTRANEOUS BODIES IN THE ŒSOPHAGUS.

IT frequently happens that persons, from hurry or voracious-
ness, in attempting to swallow a large piece of beef, tripe, gristle,
cheese, bread, and other similar substances, are choked, and in
danger of suffocation. In other instances, fish bones, chicken
bones, pins, and needles, pieces of coin, stick in the pharynx or
œsophagus, and excite irritation in proportion to their size,
shape, &c. There is reason to believe, in most cases of the kind,

* See vol. i. p. 113.

that the difficulty of breathing which ensues, arises from the spasmodic action of the muscles of the glottis by which this chink is preternaturally constricted. Death may follow from this cause, or from the foreign body distending the œsophagus to such a degree, as to press upon the trachea and interrupt the passage of air, or the patient may die at some subsequent period from inflammation or gangrene induced by the continued pressure of the extraneous body, or injudicious and violent attempts to remove it.

REMOVAL OF FOREIGN BODIES FROM THE ŒSOPHAGUS.

When a large substance is swallowed, it generally sticks in the pharynx or between the cornua of the os hyoides and thyroid cartilage, and often may be seen or reached with the finger. In like manner, fish bones and other small and irritating bodies, when similarly situated, may be removed by a pair of forceps, or by tickling the fauces with a feather, or by holding a solution of tartar emetic in the mouth. These last, by exciting vomiting, have the effect of expelling the foreign body. There are, however, several regular instruments well adapted to the removal of articles lodged in the throat; but the surgeon, if suddenly called to a patient apparently choking, and in imminent danger of his life, should waste little time in searching for these instruments. On the contrary, he should seize upon any thing that happens to be in his way, calculated to dislodge the morsel —such as a horsewhip, the handle of a spoon, a rattan, &c. As a general rule, digestible articles, provided they are free from asperities, should be forced into the stomach by the *probang*— a whalebone rod, having a round piece of sponge fixed upon one end and a blunt hook upon the other. This instrument (its sponge being previously softened a little) may be easily introduced by thrusting it against the back part of the pharynx. The sponge imbibing freely moisture, fills up entirely the œsophagus, and carries the body before it, unless very firmly fixed.

Copper coins, and all sharp or ragged bodies, should, if possible, be extracted by the gula forceps, probang hook, or by a hook made of a piece of bell wire, upon the spur of the occa-

sion. Sometimes a rod of whalebone, with numerous loops of thread or horse-hair attached to one end of it, answers an excellent purpose, by entangling fish bones and other sharp bodies. After extraneous substances have been pushed into the stomach, the patient should take, for several days successively, purgatives and mucilaginous draughts, to promote their passage through the intestines. For several years Dr. Physick has been in the habit of prescribing *rice*, and other similar articles, in large quantities, with a view of defending the coats of the stomach from the action of foreign bodies—and usually with great success. Needles and pins that have been swallowed, not unfrequently perform extensive journeys throughout the body, and at last are discharged through the skin.

Dr. Henry Bond,* of this city, has made a very ingenious improvement on the common gullet forceps. That instrument, as is well known, is defective, chiefly, on account of the blades closing upon each other with a flat surface, thereby leaving, necessarily, four sharp or angular edges, well calculated to *pinch* the lining membrane of the œsophagus. To obviate this inconvenience and danger, Dr. Bond's forceps have been bevelled off from the edges to the centre of the inner surface of each blade, so as to produce two convexities, or ridges, which are slightly serrated, and meet each other at a single line. Besides holding the foreign body with sufficient firmness, the narrow rough line allows the article contained in its grasp, " to *vibrate* freely and to assume a position nearly parallel to the blades."

A case occurred, some years ago, in the Eastern States, where a fish-hook, with part of the line attached to it, was swallowed. In the attempts to remove it, by pulling upon the line, the hook became fixed in the side of the œsophagus. After much difficulty, it occurred to an ingenious person present, that the proper mode to extricate the hook would be, to take a large leaden bullet, drill a hole in its centre, pass the line through it, and let it be swallowed by the patient. The experiment was accordingly tried, and with success—the bullet, by its weight, first disengaging the hook, and then its point being afterwards brought

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* Observations on the Removal of Foreign Bodies lodged in the Œsophagus, by Henry Bond, M. D., in North American Med. and Surg. Journal, for October, 1828.

in contact with the lead, was prevented from sticking again in the œsophagus, in the act of drawing upon the line, so that both the bullet and hook were drawn out together. These particulars were communicated to me formerly, by a very intelligent student, Dr. Bradley, of Maine; but I have forgotten the name of the surgeon concerned in the case.

The operations called *pharyngotomy* aud *œsophagotomy* should seldom, I conceive, be performed; but in order to sustain the patient's breathing, during the attempts to remove a large body from the pharynx or œsophagus, it may possibly become expedient to resort to bronchotomy or tracheotomy, as will be explained hereafter. It sometimes happens, however, that a foreign body can neither be gotten up nor pushed down. In that case, if it can be felt externally, it may be cut upon and extracted, no matter whether upon the right or left side. Guattani long ago recommended the operation, and brought forward successful cases. But in modern times it has not been generally resorted to. It was executed in 1832 by Mr. Arnot, of London, upon a child two years old, without difficulty, and would no doubt have proved successful, if performed sufficiently early.

SECTION II.

STRICTURE OF THE ŒSOPHAGUS.

THE œsophagus, like the urethra, is sometimes the seat of stricture, either of the spasmodic or permanent kind. Nervous and hysterical patients are most subject to the former disease, and the latter may occur in patients of every variety of constitution. Occasionally, the two affections are combined. Permanent stricture is met with in two or three different situations. Its most common seat, however, is immediately behind the cricoid cartilage, or in the commencement of the œsophagus. The contraction is generally found to consist of a fold of the internal membrane of the tube. In advanced cases of the disease, the whole cavity of the œsophagus is often entirely closed, and to a considerable extent, arising, probably, from the effusion of lymph, or from the glands of the passage assuming a scirrhous or cancerous action. The symptoms of permanent stricture of the œsophagus are difficulty of swallowing, in proportion to the duration of the disease, pain in the stomach, nausea, troublesome eructations, pain in the fauces, extending thence along the base of the skull. In addition to these symptoms, the patient often finds it impossible to pass either solids or fluids in the smallest portion, and as a necessary result, emaciation ensues. Some patients, however, can readily swallow fluids, especially when sipped in small quantities ; others find it easier to swallow solids.

The causes of this disease are very obscure. In most instances, there is reason to believe that the permanent stricture is the result of inflammation, however induced. By Dr. Burwell, an intelligent practitioner of Buffalo, I am informed that several cases of the disease have occurred in his neighbourhood, from drinking liquor of pearl-ash, kept by most housewives, to lighten their bread, and generally deposited in the

same closet with spirits, for which it has been mistaken. Similar cases have been reported by Sir Charles Bell,* from the accidental swallowing of soap-lees.

A disease very opposite in character to stricture of the œsophagus is sometimes met with—paralysis of the œsophagus. This occurs, for the most part, in old people, and frequently as a concomitant of palsy in other parts of the body. The power of the muscular fibres of the œsophagus being impaired or lost, the patient can take neither solids nor fluids, and, unless speedily relieved, must die of inanition.

TREATMENT OF STRICTURE OF THE ŒSOPHAGUS.

Bougies, either alone or armed with lunar caustic, may be considered the only remedies for permanent stricture of the œsophagus. To ascertain the situation and extent of the stricture, a soft wax bougie is employed. This may be readily introduced, by directing the patient to draw back his tongue and imitate the action of swallowing. If the stricture is ascertained, from the resistance and the impression made on the end of the bougie, to be a permanent one, the caustic bougie may be immediately carried down, and kept in contact with the stricture three or four minutes. In two or three days the operation may be repeated, and kept up occasionally till the stricture is destroyed, or until a common bougie will readily pass.

For the relief of *spasmodic* stricture of the œsophagus, I have often employed the unarmed bougie, and with the happiest effect. In such cases, also, the internal use of valerian, camphor, opium, ether, will be found highly serviceable.

Paralysis of the œsophagus may be sometimes removed by electricity. To nourish the patient during the cure, the gum elastic œsophagus tube is essential. The surgeon should take care that fluids conveyed through it are not too hot, otherwise the stomach may be scalded. From this cause, several patients have lost their lives. When the œsophagus, from stricture or any other cause, is so completely closed that a bougie or gum elastic tube will not pass, the patient must be nourished by clysters.

* Surgical Observations.

The cardiac, as well as other portions of the œsophagus, is not unfrequently the seat of scirrhous and cancerous affections. The progress of the disease is generally very slow and gradual. Often it is mistaken for common stricture of the œsophagus, and treated accordingly; by which the symptoms are aggravated and the ulceration hurried on. In many instances the disease extends to the stomach, all the coats of which, as well as those of the œsophagus, are indurated and often ulcerated to a great extent. Such affections, are, of course, incurable. The celebrated Napoleon died of cancer of the stomach.

Tumours situated between the trachea and œsophagus, enlargement of the thyroid gland, indurated lymphatic glands, aneurism of the aorta, and other affections, may, by pressure, involve the œsophagus, and generally admit of no relief.

SECTION III.

EXTRANEOUS BODIES IN THE LARYNX AND TRACHEA.

DURING the act of deglutition, articles of food, instead of passing into the œsophagus, are sometimes suddenly diverted from their course, and thrown into the glottis. An instantaneous, violent, convulsive cough, and laborious respiration, are the consequences. If the extraneous body should be detained in the glottis, death speedily follows from suffocation; but in many instances, the body passes entirely through the chink of the glottis into the trachea, or else it is forced by the cough into the laryngeal pouches. In either case, the patient is saved for the time, or eventually may recover. The lodgement, indeed, of a morsel in the sacculus laryngeus, is comparatively harmless, and the irritation occasioned by its presence soon subsides. I have known extraneous articles to remain in these cavities for years, without inconvenience, and, indeed, without the patient being sensible of their presence. When, however, the substance descends into the trachea, incessant irritation is kept up, and, although the patient, even under these circumstances, may survive for weeks, months, or years, yet in the end, unless relieved by an operation, he is almost sure to die—from effusion into the cells of the lungs, or from phthisis pulmonalis.

REMOVAL OF EXTRANEOUS BODIES FROM THE LARYNX AND TRACHEA.

It is very seldom that the surgeon succeeds in extracting by instruments an extraneous body lodged even in the *vicinity* of the larynx; of course, the removal of it from the larynx or trachea, by such means, is out of the question. But to obviate instantaneous suffocation, or to remove the foreign body, an operation may be required.

Laryngotomy and *tracheotomy*, (so denominated according as the larynx or trachea may be the seat of the operation,) are both

occasionally required. The former, however, is best adapted to the removal of extraneous bodies, and is performed in the following manner. The patient being laid on a table, with his head supported by a pillow, and thrown moderately backwards, the surgeon feels for the membranous space situated between the thyroid and cricoid cartilages, makes a perpendicular incision about an inch in length through the integuments, platysma-myoides, and between the sterno-thyroidei and sterno-hyoidei muscles. Any vessels that may have been divided, are next carefully secured, and the bleeding having entirely ceased, it only remains to push the knife through the crico-thyroid membrane, when the extraneous substance will be either immediately thrown out or presented at the wound. Sometimes it is too large to pass through the membranous space. In that case, the incision should be prolonged upwards by separating from each other the two lateral parts of the thyroid cartilage. As soon as the foreign body is removed, and the patient's breathing restored, the wound may be drawn together by adhesive straps, and permitted to heal.

Tracheotomy is now seldom resorted to, both on account of the difficulty of the operation, and the danger of wounding important blood-vessels. Should it ever become necessary, however, it may be done in the following way. The surgeon makes an incision, from below the cricoid cartilage, and extends it through the skin and platysma-myoides, nearly as far as the sternum. The sterno-hyoidei and sterno-thyroidei muscles are next carefully pushed aside by the fingers, until the surface of the trachea is cleared, and when all hemorrhage has ceased, two or three of the rings of the trachea may be divided by a perpendicular cut.

These operations may be required for other purposes than the removal of extraneous bodies, and in that case the surgeon will generally find it necessary to keep the orifice of the wound open for some time afterwards. This should not be done, I conceive, by a cannula, which, independently of its liability to become clogged by the mucus of the passage, excites always a great deal of irritation. Upon two or three occasions in which I have found it necessary to open the membranous space, in order to sustain the patient's breathing, I have dissected away the corners of the crico-thyroid membrane, and instead of intro-

ducing a cannula into the larynx, have merely prevented the integuments and muscles surrounding the opening from closing, by passing a piece of tape around the patient's neck, having attached to each of its extremities a piece of silver wire doubled, and bent in the form of a hook, and calculated, by pulling these parts in opposite directions, to keep them asunder—at the same time covering with a bit of gauze the opening in the larynx, to prevent the admission of dust and other extraneous matters. Laryngotomy and tracheotomy will sometimes be necessary, on account of substances lodged in the *œsophagus*, for cynanche trachealis or croup, for enlargement of the tongue or of the tonsils, for ulceration of the glottis, for suspended animation in persons apparently drowned, &c. In cases of croup, the operation seldom succeeds, owing to effusion having generally taken place in the lungs before the expedient has been resorted to. Some surgeons, and particularly Desault, in place of opening the larynx or trachea, on account of obstructions in the œsophagus, introduce a gum elastic tube into the windpipe, from the nose or mouth, with a view of sustaining respiration until the obstructions are removed. The practice, in my estimation, putting the difficulty of the operation aside, is injudicious and censurable.

On Diseases and Accidents of the Œsophagus and Trachea, consult Pelletan's Clinique Chirurgicale, tom. i.; Desault's Works, by Smith, vol. i.; C. Bell's Operative Surgery, vol. ii.; C. Bell's Surgical Observations, vol. i.; Lawrence on some Affections of the Larynx, &c., in Medico-Chirurgical Transactions, vol. vi.; Chevalier's Case of Croup, vol. vi. of Medico-Chirurgical Transactions; Monro's Morbid Anatomy of the Gullet and Stomach; Burns's Observations on the Surgical Anatomy of the Head and Neck; Hopkins's Case of a Shot in the Trachea, in Potter's Medical Lyceum. In this case, the shot was removed from the trachea of a young lady, by her mother, who, without apprising the patient of her intention, suddenly seized her while lying over the edge of a bed, and forced her head and shoulders towards the floor. The shot being carried by this movement towards the glottis, was instantly discharged.

On Œsophagotomy—Verdue, Pathologie Chirurgicale; Guattteni, in Memoirs de l'Acad. de Chirurg. tom. iii. 4to.; Arnott, in Med. Chirurg. Transact. vol. xviii.; Malgaigne, Man. de Med. Operat.

SECTION IV.

ULCERATION OF THE GLOTTIS.

From syphilis, abuse of mercury, and from other causes, the glottis is sometimes ulcerated, the epiglottis destroyed, the bony portion of the thyroid cartilage rendered carious, and covered with abscesses. This disease originates in the glandular structure of the larynx and trachea, and increases gradually, if not arrested, until it destroys the patient. The symptoms are a troublesome, hacking cough, with purulent and bloody expectoration, great difficulty of breathing, a peculiar, husky, wheezing, whistling, almost inaudible voice. After labouring under the disease for a few months, the patient dies from suffocation, from effusion upon the lungs, or from irritation. Sometimes the disease appears to be hereditary; at least, I have upon several occasions known different members of the same family attacked by it in succession. Some years ago I attended, with Dr. Shaw, of this city, a female who laboured under the disease, and finally died from it. Her sister, a stout, healthy young woman, was attacked a few months afterwards in the same manner, and also died. A similar ulceration I have often met with, extending to the pharynx, and throughout the œsophagus.

TREATMENT OF ULCERATION OF THE GLOTTIS.

When there is reason to suspect that ulceration of the glottis or epiglottis depends upon a syphilitic taint, mercury, sarsaparilla, the nitro-muriatic bath, and other remedies of similar character should be employed. As a local application, there is nothing so serviceable as a solution of the argentum nitratum in the proportion of forty grains to an ounce of water. The practice originated, I believe, with Sir Charles Bell: his mode of applying the caustic is to attach a pad of lint to a piece of wire, dip it in the solution, and, taking care to depress the tongue

with a finger, place the lint in contact with the ulcerated sur-
face.   As a measure of necessity, Mr. Bell once performed the
operation of laryngotomy, for ulceration of the glottis, with
instantaneous relief to the patient, who continued to breathe
freely through the opening for six weeks, but at last died in con-
sequence of closure of the aperture by fungous granulations, the
growth of which it was found impossible to repress.

For the ulceration that attacks the pharynx and œsophagus,
the nitrate of silver I have found to be, also, the best remedy.
Many cases of the disease, however, I have met with, have
proved intractable under any treatment, though the patient's
health did not appear to suffer from the continuance of the
ulceration.   In some instances I have traced the disease to dis-
order of the digestive organs, and have relieved it by diet and
appropriate medicines.

SECTION IV.

BRONCHOCELE, OR GOITRE.

THE terms bronchocele, tumidum guttur, hernia bronchialis, gongrona, hernia gutturis, and others of similar import, are employed to denote a morbid enlargement of the thyroid gland. The word goter or goitre, was invented by the Swiss, and is probably a corruption of the Latin phrase guttur. In England the disease is known, in popular language, under the name of Derbyshire neck, or monstrous craw.

Bronchocele has prevailed in certain countries, from time immemorial. It is noticed by some of the ancient poets, and by many of the early writers on medicine. It is met with oftener in mountainous than level countries, and is frequently endemial and hereditary. According to Coxe, the disease is common in the neighbourhood of Berne, Friburg, Lucerne, Aigle, Bex, Dresden, in the valleys of Piedmont and Savoy, in most parts of the Vallais, in the Valteline, &c.* In the village of La Batia, Dr. Reeve saw many cretins and goiterous persons, who all lived in adjoining houses.† The village of Villenéuve d'Aoste, which is surrounded by very high mountains, contains an immense number of persons who labour under goitres of enormous magnitude.‡ The late Dr. Howard of Baltimore, during his rambles in Switzerland, first met with goiterous persons and cretins near Sion. The number of each continued to increase as he approached Martigny and St. Maurice, at which places they were exceedingly numerous. As he descended the Rhone their numbers decreased. In the year 1800, the villages of St. Jean, St. Michael, St. Maurice, and the vicinity of Aiguebelle, according Foderé, contained a greater portion of cretins and persons labouring under goitre than any other part of Switzerland. Dr. Howard was informed that both cretinism and goitre had diminished within the last few years, in consequence of the richer

* Coxe's Travels in Switzerland.
† Reeve's account of Cretinism, in the Edinburgh Medical and Surgical Journal, vol. v. p. 33.
‡ Saussure's Voyages dans Les Alpes.

inhabitants sending their children, until their tenth or twelfth year, to the mountains, where their wives also remained during pregnancy, and for some time after parturition. In the mountainous parts of Spain and Germany goitre prevails to a considerable extent. In France, it is chiefly met with in the districts of Cevennes, Soissonais, Vosges, Rouergue, Doubs, and Ardeches. In England it is very common in the mountainous parts of Derbyshire, in Buckinghamshire, Surry, and in the county of Norfolk. Occasionally it is seen in Nottinghamshire.* Sir George Staunton says, that goitres are very common in those parts of Chinese Tartary which resemble the mountains and valleys of Savoy and Switzerland.† " In Bengal," says Turner, " this unsightly tumour is known by the name of gheig and aubi ; and in Boutan is called bà or ke ba, the neck swelling, and forms itself immediately below the chin, extending from ear to ear, and sometimes growing to such an enormous size, as to hang from the throat down upon the breast. It is particularly observable among the inhabitants of the hills of Boutan, immediately bordering upon Bengal, and in the track of the low country watered by the rivers that flow from thence to the south, beyond the space of a degree of latitude. The same malady prevails among the people inhabiting the Morung, Nipal, and Almora hills, which, joined to those of Boutan, run in continuation, and bound, to the northward, that extensive tract of low land embraced by the Ganges and the Burrampooter. The same disease is also more particularly met with in the low lands adjoining those hills. From the frontier of Assam, north latitude twenty-seven degrees, east longitude ninety-one degrees, it is to be traced through Bishee, Gooch, Bahar, Rungpore, Dinagepore, Purnea, Tirrooto, and Betiah, along the northern boundary of Oude, in Gooracpore, Barraitch, Pillibeat, and on the confines of Rohilcund to Hurdwar, situated in north latitude thirty degrees, east longitude seventy-eight degrees twenty-five minutes. It has the effect, or is rather accompanied with the effect arising from the same cause, of debilitating both the bodies and the minds of those who are affected with it."‡ Park, in giving an account of the

* Clark's Reports from the general Hospital near Nottingham, in the Edinburgh Journal, vol. iv.

† Staunton's Embassy to China.

‡ Turner's Account of an Embassy to Tibet.

diseases of the Mandingo negroes, states that goitres are very common in some parts of Bambarra.*   Throughout the island of Sumatra, bronchocele is met with as an endemic disease, and is particularly frequent in those valleys which are surrounded by the highest mountains.†   In some of the Spanish settlements of America, goitres are so common, that the greater number of the inhabitants labour under the disease ; and at the village of Jacaltenango, near Sacapula, it is said that no individual can be found without an enlargement of the thyroid gland.‡   In Santa Fe, Guatemala, Nueva Gallicia, and Nicaragua, the complaint has long been known.   It is common also among the Indians who inhabit the valleys of the Cordilieres.   According to Humboldt and Bonpland, goitre is an endemic disease at New Grenada, and is so common at the small villages Hunda and Monpar, on the borders of the Magdelaine river, that it is difficult to find an individual who is exempt from it. It affects indiscriminately all classes of inhabitants, except the blacks and those who lead a very laborious life.   The ferrymen at Carthagena are not subject to it.   Females are oftener affected than males.   At the Isthmus of Darien many persons are horribly disfigured by enormous bronchoceles.§   In various districts, and throughout whole tracts of country in North America, bronchocele prevails as an endemic.   It is very frequent in many parts of Lower Canada, especially near the marshes between St. John's and Montreal.   At Detroit, Lake Ontario, Oneida, Erie, Huron, and among the Tuscorora, Seneca, Oneida, and Brothertown Indians, it is very common.‖   In many parts of the State of Vermont, especially Bennington and Chittenden, bronchocele is well known.   It is also found at Camden, Sandgate, and Chester, in the same State.   Sandgate, some years ago, contained one thousand and twenty inhabitants, and out of that number one-fourth of the females were affected with this disease.¶   According to Dr. Trask, bronchocele is so common a disorder at Windsor, in Vermont, that hardly any female is exempt from it.**   In the State of New York goitre

* Park's Travels in Africa, p. 413.   † Marsden's History of Sumatra.
‡ Barton's Memoir on Goitre.   § Alibert's Nosologie Naturelle, p. 470.
‖ Barton's Memoir.
¶ Dorr's Facts concerning Goitre, New York Medical Repository, vol. x.
** Mease's Observations on Goitre.

prevails principally in the neighbourhood of Old Fort Schuyler, the Oneida village, the German Flats, Fort Herkimer, Fort Dayton, Henderson Town, Onondago valley, Canasaraga, Brothertown, the townships of Manlius, and the whole of the military district.* I am informed by Philip Church, Esq., who resides at Angelica in Alleghany county, State of New York, that goitre is a very frequent complaint in his neighbourhood and the surrounding country. In Pennsylvania, where bronchocele is very common, it is found chiefly at Pittsburg, on the waters of the Alleghany, Sandusky, Monongahela, French Creek, at Canonsburgh, Brownsville, and throughout the county of Somerset. In some parts of Virginia,† especially at Morgantown and on the banks of Cheat river, it is by no means unfrequent. In certain situations on the western shore of Maryland, and in North and South Carolina, the disease is occasionally met with. It is probable, indeed, that goitre may be found as

* Barton.

† DR. GIBSON.

Sir, I take the liberty of communicating to you a fact, which has fallen under my observation, relative to the disease known by the name of goitre, or bronchocele, which, if it be not useful in throwing some light on the cause of this inexplicable affection, will at least prove curious to the surgeon and physician.

At King's Saltworks in the county of Washington, Virginia, and not far from my own residence, this disease has prevailed for a number of years; for any thing that I know to the contrary, its existence is coeval with the commencement of the manufacture of salt at that place. Hitherto, it has been confined exclusively to females, and to those who reside at the very spot where the process of vaporization is carried on; the subjects of it consisting chiefly of the families of the immediate superintendents. Persons living at the distance of a half, or even quarter of a mile are not subject to the disease.

Contrary to what might be supposed from the aspect of the neighbouring country, this disagreeable affection is of exceedingly rare occurrence in this part of the state, with the exception above alluded to. No satisfactory reason has been assigned for its existence at this place. It has, however, been ascribed to the water used for drinking. I have drunk of the same water myself, and found it insipid and unpalatable; but was unable to detect in it the presence of any other mineral but lime, which is the common character of the water of the country. It may, perhaps, be proper to state, that a removal to another situation, is not attended with a removal of the complaint.

Whatever may be the cause of this disease, as it exists here, which, I think, is entirely inscrutable, such is the certainty with which it attacks those who come within the sphere of its influence, that every woman who goes to King's Saltworks to live, previously makes up her mind to become sooner or later a subject of goitre.   JOHN T. SMITH, M. D.

December 22*d*, 1831.

an endemic disease, in almost all the mountains and marshy districts throughout the United States. All writers on the complaint, agree that it generally prevails in valleys at the bottom of the highest mountains, which are particularly exposed to the influence of easterly and southerly winds. In those situations, moreover, where the temperature is mild and uniform—where the atmosphere is moist—in the neighbourhood of rivers, of falls or lakes, or of the sea,—where the soil is rich, and the habitations surrounded by fruit trees, goitres are commonly found.

Every age and sex is liable to goitre, but females are oftener affected than males. In children, it seldom occurs until after the eighth or tenth year, and old people are little subject to it. Three instances, however, are mentioned by Foderé, where it was found at birth, and another, in an infant fifty days after birth.* Dr. Sterndale has also furnished an example, where a child in Derbyshire was born with a goitrous tumour of considerable size.† Those females who are not subject to bronchocele before marriage, generally perceive its commencement during pregnancy.‡ Persons of relaxed constitutions, of white and delicate skins, and whose complexions are red mixed with a brownish tinge, are most predisposed to the disease. Children who are to become goitrous, have large blue, sprightly eyes, beautiful skins, and fair hair. Their memory is very forward. When the disease appears, every thing is changed. As it advances, the eyes become dull, the face acquires a white colour and unmeaning look, and the faculties are at a stand. When the goitre is very large, respiration becomes difficult, the pronunciation of consonants imperfect, and the body ceases to increase except about the head and shoulders. In a goitrous country, the children are born goitrous after two generations of the intermarriage of goitrous parents. After the third marriage, the child becomes a cretin. A semi-cretin, weak and rickety, married to a goitrous woman, has children born goitrous.§ During the winter, a goitrous tumour is diminished in size, but it augments with the return of warm weather, and is larger during autumn than at any other season. The disease

* Traité du Goitre et du Cretinisme.
† London Medical Repository, vol. x. p. 200.   ‡ Foderé, p. 62.
§ Foderé, also Chapman's Notes on Allan's Lectures.

is not confined to the human race; horses, horned cattle, calves, sheep, dogs and other inferior animals are subject to it."*

In the commencement of bronchocele, a small tumour may be perceived, either on one or both sides of the trachea and larynx. Sometimes the swelling occupies each lobe of the thyroid gland, together with its isthmus, so as to constitute a uniform tumour; at other times, there is a depression at the centre, following the course of the trachea, and marking the natural division of the lobes. Occasionally the enlarged lobes are studded over with a number of lobules. The swelling generally continues small and circumscribed for a considerable time, and often extends backwards, so as to render it difficult to ascertain, by inspection or examination, whether goitre exists or not. For the most part it is soft to the touch, and possessed of so little sensibility, that it may be rudely handled, without producing much uneasiness. It is sometimes closely compressed by the muscles which cover it, and is then elastic and firm. Although the thyroid gland, both in its natural and enlarged condition, is not very susceptible of inflammation, yet, when this state is once induced, it becomes exquisitely tender, and is accompanied with a difficulty of respiration and deglutition, which the most active antiphlogistic measures can hardly subdue. Almost all the goitres which have come under my notice in America, have commenced in one lobe of the gland—the other lobe in a short time being affected in a similar manner. Alibert says that he has found the right lobe oftener enlarged than the left.† In the worst cases of goitre I have seen, the tumour has exceeded in size a large cocoanut, and has become at particular times very troublesome to the patient, by its weight and pressure upon the trachea and adjacent parts. In countries where the disease is endemic, it is not uncommon for the tumour to attain an enormous magnitude. Foderé relates instances of such tumours weighing seven or eight pounds.‡ A case is recorded by Alibert of a man thirty-eight years of age, who had a goitre which extended below the middle of the chest and equalled in size a large pumpkin. "La poche énorme que s'est formée au dessous de son menton, resemble à celle de l'oisseau désigné communé-

* Coxe's Travels; Barton's Memoir; Clark's Reports.
† Nosologie Naturelle.   ‡ Traité du Goitre, &c., p. 497.

ment sous le nom de *pelican*, et qui figure comme object de
curiosité dans les cabinets des naturalistes." The same author
details the case of a female, upwards of sixty years old, who
had resided the greater part of her life near Chamouny at the
foot of Mont Blanc, and who, from her infancy, had laboured
under a bronchocele, which was divided into innumerable lobes,
which extended from ear to ear, blocked up the cavities of each,
so as to destroy the hearing, and finally descended on the
chest, lower than the mammæ, interrupting the breathing and
swallowing to such a degree, as almost to produce suffocation,
every time she attempted to take the least particle of nourish-
ment, solid or fluid. But cases have been related by Mittle-
mayer and others, in which the goitrous tumours have descended
below the umbilicus, and even to the knees.* We have no
reason to suspect these accounts exaggerated, when we remem-
ber the reports of Sir Robert Wilson, Larrey, and others,
respecting those prodigious tumours, common in Egypt and
many warm climates, in consequence of the descent of the
abdominal viscera, which, in some instances, have reached the
ground. The cases of enormous hydroceles, also recorded by
Keate,† and the voluminous cutaneous excrescences described
by Mr. John Bell, and by Dr. Roper of Charleston, leave no doubt
on the subject.

Notwithstanding the peculiarities of goitre, it is not easy
always to distinguish it from other diseases. It may be con-
founded with aneurism of the carotid artery, with scrofulous
enlargement of the lymphatic glands, with encysted and sarco-
matous tumours of the trachea and its vicinity, with dilatation
of the internal jugular vein, and perhaps with other complaints.
From aneurism it may be distinguished, in general, by want of
pulsation, by the comparative insensibility of the tumour, by
the softness of its texture, by its mobility, and by the circum-
stance of the swelling accompanying the motions of the larynx
and trachea, when the patient is desired to imitate the action of
swallowing. But sometimes the goitre is so large, and is so
identified with the adjacent cellular texture, that little or no
movement of the trachea can be observed. When goitre is
extensive, and occupies one side of the neck only, and when, at

* Nosologie Naturelle, p. 468.   † Dissertatio de Strumis et Schrophulosis, 1723.

the same time there is a pulsation in it from the enlarged and
varicose state of the vessels, we shall not find it always easy to
discriminate between it and aneurism. Occasionally a pulsation
is communicated from the carotid to a goitrous tumour, which
happens to lie over it. One instance is noticed by Burns,
where the carotid was deeply imbedded in the substance of an
enlarged thyroid gland. " The carotid artery being placed,"
says he, " in the body of the tumour, is neither very rare in
occurrence, nor very difficult to explain. It is, indeed, a natural
consequence of the extension of the tumour laterally ; yet it
will not happen in every tumour : it will only occur in those
cases, where the consistence of the morbid parts is soft. When
the tumour is firm, it pushes the artery, nervus vagus, and
internal jugular vein aside. When it is soft, these, as in the
present instance, sink into its substance."* In most instances
of aneurism, however, the carotid is deeper seated than bron-
chocele, and the pulsation so strong as scarcely to be mistaken.
Notwithstanding this, cases have been related where the most
able surgeons have found it impossible to offer a decided opinion.
A creole negro had a tumour on the neck, which was submitted
to the inspection of some of the most celebrated surgeons in
America, Paris, and London ; all of whom pronounced the
disease an aneurism of the carotid artery ; but it was after-
wards ascertained by Boyer, that no such disease existed—but
simply an extensive enlargement of the lymphatic and other
glands of the neck.† The late Dr. Samuel P. Griffitts has fur-
nished us with an interesting history of a tumour of the neck,
bearing so strong a resemblance to carotid aneurism, as to be
mistaken for the disease by himself, Drs. Chapman and Morgan,
and the late Dr. Dorsey. Upon dissection by Dr. Parrish, it
was distinctly ascertained that the carotid was free from disease,
and that the tumour was composed entirely of the thyroid
gland.

" It was elongated," says Dr. Parrish, " and had obtained a
situation directly over the carotid artery ; the patient's neck was
very short, the pulsation in the carotid was imparted to the
tumour lying over it ; and, I am informed, there was a strong

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* Surgical Anatomy of the Head and Neck, page 224.
† Dictionnaire des Sciences Medicales, vol. xviii. p. 541.

resemblance to the aneurismal jar or thrill. We are aware that in dropsy of the chest and pericardium, the heart often palpitates most violently; and this morbid pulsation may explain the throbbing of the carotid, which bore so strong a resemblance to aneurism."* One circumstance which deceived Dr. Griffitts, was the impossibility of drawing the tumour from the artery. " I had frequently endeavoured," says he, " to remove, with my fingers, the tumour from the artery, wishing to think the disease was glandular, but could not succeed, as the tumour was so firmly fixed over the vessel as not to be moved from it; and the pulsation was such as to convey the idea that there was no inter-vening substance." Under ordinary circumstances, this plan of drawing the tumour from the artery is excellent. It was by relaxing the muscles of the neck, and separating with the fingers the tumour from the artery, that Boyer was enabled, in the case referred to, to discriminate between the disease and aneurism. By similar means, I have often succeeded in distinguishing en-larged glands and other tumours situated over large arteries, in different parts of the body.

Many writers have confounded goitre with scrofula: but there would appear to be no legitimate foundation for such a conclusion. In scrofula, the lymphatic glands of the neck and other parts of the body are particularly involved; and other marks in the system, too well known to require description, evince the existence of the scrofulous constitution. These symptoms do not generally accompany the goitrous tumour. Goitre is strictly a local complaint—scrofula affects the whole system, and appears at a much earlier period of life than goitre. In countries where bronchocele is endemic, the scrofulous are equally liable, no doubt, with others, to the complaint. Persons who remove from settlements where goitre does not exist, into countries where the disease prevails, are subject to it; but on residing again for some time at their original home, the tumour disappears generally in a short time. This is seldom the case with scrofula, which is little influenced by change of climate. The scrofulous tumour is harder to the touch, and more painful than the goitrous tumour. It is more disposed to suppurate than bronchocele; besides, goitre is nearly unknown in certain

* Eclectic Repertory, vol. ix. p. 120.

countries, where scrofula is the common disease. In Scotland, scrofula is almost universal,—goitre hardly ever met with. In Switzerland, goitres are very common, and affect all classes of society, while scrofula is very rare. It is possible for an enlarged thyroid gland to extend so far beyond its natural boundaries as to occupy the situation of the lymphatic glands of the neck. Mr. Burns has furnished a very instructive case of this kind, in whch it would have been impossible, perhaps, without dissection, to have ascertained the true nature of the swelling. " Beneath the sterno-mastoid muscle," says he, " the enlarged gland was lobulated and clustered into small processes, precisely resembling a chain of enlarged concatenated glands. Indeed, had I alone trusted to the impressions received before dissection, I would have been led to believe that the lymphatic glands of the neck were actually swelled, and, besides that, several of the conglobate glands, placed behind the sterno-mastoid muscle, between it and the trapezius, were also affected ; for into that space processes from the left lobe of the thyroid gland extended."*

A dilatation of the internal jugular vein is not an uncommon disease, and may sometimes be mistaken for goitre. It may be distinguished, generally, by its low situation—the swelling appearing just above the sternum. The tumour may also be known from goitre, by its softness and compressibility, by its pulsatory and tremulous motion—by the sudden return of the tumour, when pressure is removed—by more or less turgescence, along the whole course of the vein. I once attended a patient, four or five years of age, with Dr. Jennings of Baltimore, upon account of a large swelling of the neck, the precise nature of which, it was difficult to ascertain for some time. It resembled in many respects the enlarged thyroid, and in others, diseased lymphatic glands, but turned out to be a dilatation of the internal jugular. The interesting case of a tumour of the neck, detailed by Mr. Hey, the nature of which he could not ascertain, I have no doubt, was an enlarged vein, and probably the jugular.† The morbid distension of this vessel has been confounded occasionally with aneurism of the aorta.‡

An encysted tumour may occupy the anterior surface of the

* Surgical Anatomy, p. 196.
† Hey's Practical Observations in Surgery, 3d edition, p. 448.
‡ Burns on the Diseases of the Heart, p. 259.

trachea; in many respects it is analogous to goitre—is free from pain—is soft and doughy to the feel—follows the motions of the larynx and trachea, and may attain a considerable size. It extends on the trachea as high as the thyroid gland, and descends behind the sternum. The disease has never been described, I believe, as occupying this situation. I have seen only two or three cases of it. An officer of the army consulted me, some years ago, respecting such a tumour, which had been shown, previously, to several practitioners, who could not give a decided opinion as to its nature. At first I suspected it to be a goitre, but the patient assured me that it had emerged, originally, from behind the sternum, and was occasioned, so far as he could determine, by the pressure of a leathern stock, which had been worn unusually tight. This circumstance inclined me to believe, that the tumour had no connexion with the thyroid gland, and determined me to puncture it with a lancet. A thick, yellow, cheesy matter, extremely offensive, and three or four ounces in quantity, was discharged from the wound by pressure. The opening was then enlarged, and a probe could be passed to a considerable distance behind the sternum, and upwards along the trachea. The cavity was filled with lint and stimulating injections were frequently employed. Suppuration was established with difficulty, and the cavity was filled up in the course of two or three months. I met with a similar disease afterwards, in a young woman seventeen years of age, and removed it by the same treatment. The wound, however, remained fistulous for a considerable time, in spite of every remedy used. In both cases, these tumours extended so far upwards, and were so deeply imbedded under the sternum, that any attempt at excision would have been hazardous, if not impracticable.

In its natural state the thyroid gland is found to vary in different subjects. In females, it is larger than in males. It is generally made up of distinct lobules, which are collected into numerous lobes or tuberculated masses, joined to each other by a very fine cellular membrane. Rounded vesicles containing a colourless, but sometimes yellowish fluid, are mixed with the lobes. In many subjects these vesicles cannot be discovered, and the existence of a fluid is ascertained, only by rubbing slices of the gland between the fingers, when a peculiar feeling

of viscosity may be observed.*   There is no proper investing
membrane or capsule to the thyroid gland ; but the cellular tex-
ture is slightly condensed on the surface, so as to furnish a very
thin covering, from which processes proceed internally, and
form septa or partitions in various directions.   The substance
of the gland generally consists of two portions, which are placed
on each side of the trachea and larynx, and united to each other
by a transverse band or slip of the same substance. Sometimes
this band is wanting, and then there are two distinct thyroid
glands.†   No unquestionable excretory duct has yet been dis-
covered.   But small openings or canaliculi, described by Mor-
gagni, Bordeu, Walter, and some other anatomists, have been
found on the internal surface of the trachea. These openings
uniformly occupy one situation, and are two or three in number.
They may be found about the middle of the internal surface of
the *first* cartilaginous ring of the trachea.   Bordeu, in speaking
of this ring, says, " Nous avons aussi remarqué, qu'il est, dans
tous les sujets ou divisé par une fente plus ou moins étendue et
située vers le devant du cartilage, on perce d'un ou deux, et
même de trois trous bien apparens et placés aussi, vers le milieu
du cerceau sur le devant, ou un peu à coté.

"Ces trous nous frappérent la première fois que nous les
vimes : cêtoit à Montepellier, en 1741, en disséquant un larynx
auprès du feu ; la glande thyroide qui étoit extrémement grosse,
étant enlevée, nous trouvâmes le premier cerceau presque osseux,
mais assez transparent pour laisser apercevoir, au moyen du feu,
les deux trous qui n'étoient recouverts que par des membranes
lâches qu'on emporta facilement.

"Après bien des recherches, on trouva un sujet mort de
morte violente ; nous examinâmes d'abord la face posterieure
du cerceau de la trachée, sans avoir touché la thyroide ; la mem-
brane interne de ce cerceau étoit pleine de petits trous difficiles
à apercevoir ; nous introduisimes des soies dans cinq de ces
trous, et en les conduisant légérèment, elles allérent se rassem-
bler en deux endroits, trois dans l'un et deux dans l'autre ;
ces endroits étoient précisement les deux trous du cartilage ;
ces soies allérent, en les pousant, se perdre dans la glànde.

* Anatomie Descriptive , par X. Bichat.
† Soemmering de Corp. Hum. Fabric. vol. vi. p. 39.

M. Barbuot, medecin de Semur, étoit présent à cette opé-ration."*

From a perusal of these and other passages in Bordeu, some years ago, I was induced to examine the openings described, in a great many subjects, under an impression that they were the mouths of excretory ducts from the thyroid gland. To ascertain this, I made a number of experiments with the mercurial injecting apparatus, the small pipes of which were introduced directly into the openings in the cartilage, and found that the mercury sometimes passed with facility, through these small canals, but met with resistance when it reached the thyroid gland. In three or four instances I succeeded in pushing it to a considerable distance under the cellular covering of the gland, and even among the cellular texture into the substance of the gland, as I afterwards ascertained by cutting it open. But, in all probability, the mercury passed, in each case, from rupture of the cellular tissue, and did not follow the natural course of the duct. I endeavoured to find a communication between the thyroid gland and the ventricles of Galen, and with this view introduced the mercury into the bottom of each of these cavities. After several ineffectual attempts, I succeeded in filling the cellular texture of the thyroid, and to a much greater degree than from the openings of the trachea. I mention these circumstances to corroborate the suggestions of Morgagni and Bordeu, that there are passages from the thyroid gland which serve to deposit its secretions in the trachea, and perhaps in other places. The observation may be useful to those who feel disposed to investigate the subject further. In addition, I may state, that Foderé succeeded in blowing air from the larynx into the thyroid gland, so as to distend it considerably. In another instance he filled the trachea with spirit of wine, and upon cutting into the thyroid gland, the smell of the liquor was distinctly perceivable.

" Qu'on prenne," says he, " un larynx auquel, cette glande est attachée, bien lavé et nétoyé avec une légeré dissolution de potasse, et ensuite séché, qu'on en bouche exactement l'extremité inférieure, puis qu'on adapte au trou de la glotte, un tube contigue à une vessie pleine d'air, et qu'on lutte bien l'appariel ; en comprimant la vessie, on verra la glande thyroide augmenter de volume.

* Œuvres completes de Bordeu, par Richerand, tom. i. p. 98.

" La même expérience réussit, quoi qu' à un moindre degré, avec l'alcohol.   En coupant la glande après avoir comprimé la vessie, on sent distinctment l'odeur de ce fluide."*

Lalouette discovered an immediate connexion between the thyroid gland and the lymphatic vessels which pass along the thyroid and cricoid cartilages.† Many cases have been recorded by different writers, where an enlargement of the thyroid gland has been suddenly produced in consequence of violent exertions of the muscles of the neck in lifting heavy weights, or in consequence of laborious efforts of the patient during protracted and difficult parturition.   It has been maintained, also, that goitre is produced among the inhabitants of certain European districts, from the habit, which is frequent among the lower order of people of dragging burdens up the hills by cords tied round the upper part of the chest.   According to Mr. Heckewelder, who often met with goitre among the American Indians, the disease never made its appearance among the girls until they began to carry heavy burdens on their heads.‡ These circumstances would favour the idea of Bordeu, Foderé, Morgagni, and others, of the existence of a direct communication between the trachea and thyroid gland.§   Many theoretical uses have been assigned to the thyroid gland, besides those already mentioned.   It does not come, however, within the scope of my purpose to detail them.‖

When a goitrous tumour is examined by dissection, several circumstances are presented worthy of notice.   One or both lobes, and sometimes the middle lobe or isthmus of the gland, are found enlarged beyond their natural boundaries.   Upon cutting into their substance, the texture is found more or less compact, intermixed with numerous cells, containing a transparent glutinous liquor, which may be drained off in such quantity, by pressure, as to reduce considerably the bulk of the tumour.   These cells vary in size; some being large enough to contain a pea, while others are exceedingly small.   The fluid

* Traité du Goitre et du Cretinisme, p. 58.
† Haller, Elementa Physiologiæ.   ‡ Barton's Memoir, p. 46.
§ See Morgagni's Adversaria, v. p. 6.
‖ Those who wish for information on the subject may consult Haller's Elementa Physiologiæ, lib. ix. p. 22; Soemmering, de Corp. Hum. Fabr. vol. vi. p. 41 ; Coxe's Museum, vol. iii. p. 27.

they contain becomes a solid transparent jelly, when the gland has been immersed for some time in proof spirits.* Although the thyroid gland in its natural state is abundantly supplied with large arteries, yet its capillary vessels are comparatively few, and the quantity of blood determined to its substance not so great as commonly supposed. In bronchocele all the vessels are greatly enlarged, and varicose, and the quantity of blood materially increased, as is evinced by the throbbing of the tumour during life, and by injection of it after death. This preternatural accumulation of blood so frequently accompanies the kind of diseased enlargement of the gland which I have described, as to cause some writers to rank it as a particular species of goitre,—denominated *sanguineous goitre.* This distinction, as well as every other division of the disease into species, is perhaps improper, inasmuch as the appearances presented on dissection are never sufficiently uniform to enable us to characterize with precision each morbid change of structure. It is certain, however, that an unusual determination of blood generally accompanies the structure I have described, and which nosologists have called the *sarcomatous bronchocele.* In all probability, the other species mentioned are but varieties of this common and perhaps original form of the complaint.

Sometimes the texture of the goitrous tumour, instead of being compact and solid, is soft and spongy, and large cavities or membranous vesicles are dispersed throughout, which contain a thin, limpid, or serous fluid. This has been called the *encysted, serous,* or *watery bronchocele.* It is a modification only of the common disease; for sometimes the fluid changes into a yellow, tenacious, and melicerous matter. The cells of the thyroid gland are said to have been filled, occasionally, with hydatids; but such appearances may have been confounded with the watery collections just described. The *bronchocele ventosa* cannot be considered as a variety of goitre, but only an emphysematous tumour of the gland, or of the adjacent cellular texture.

It is not uncommon to find in the substance of goitres, of long

* Baille's Morbid Anatomy, p. 86; also, Engravings, Fasciculus ii. p. 25.

standing, bony particles, and even considerable masses of ossified matter. Several examples of the kind are mentioned by Bonetus, Morgagni, Kerkringius, and other old writers. Dr. Baillie, in his Morbid Anatomy, speaks of the thyroid gland being some-times converted, in old people, into a bony mass. In this respect the disease nearly resembles other sarcomatous tumours, in which we are accustomed to meet with cartilaginous and ossified productions. Calcareous concretions are said to have been discovered, in the substance of the thyroid gland, affected with goitre.* Pieces of tuftstone have been removed from the thyroid gland, in several instances, by a Swiss surgeon.†

The substance of bronchocele is seldom converted into purulent matter. But cases have been recorded by Petit and Hevin, where spontaneous cures were effected in this way. Severinus relates a case in which purulent matter was dis-charged from a bronchocele mixed with a substance resembling charcoal.‡ Dr. Baillie has given a drawing of a preparation contained in the Hunterian cabinet, where an abscess formed in the right side of the thyroid gland and afterwards com-municated by ulceration with the trachea, so as to suffocate the patient.§ Alibert relates the case of a patient in the hospital of St. Louis, who laboured for years under an enormous bron-chocele, and was eventually relieved of his burden by suppura-tion taking place in its substance. Ulceration was spontaneously established, and upwards of five pounds of purulent matter dis-charged.‖

Burns gives an instance where suppuration took place in both lobes of the thyroid gland. The matter was slowly secreted and the integuments became gradually distended, until they formed a large pouch which hung over the sternum, and contained several pounds of pus. The sides of the cyst united, and the patient was ultimately cured.¶ In speaking of abscess, following bronchocele, Portal remarks, that the cartilages of the larynx and rings of the trachea, are sometimes eroded by caries. " On a trouvé dans des sujets qui étaient morts de suffocation, les cartilages thyroide, cricoide, et les anneux cartilagineux de

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* Haller, Elementa Physiologiæ, vol. iii. p. 400.   † Coxe's Travels.

‡ De Recondita Abscessum Natura, p. 194.   § Series of Engravings, p. 27.

‖ Nosologie Naturelle, p. 467.   ¶ Surgical Anatomy, p. 188.

la trachée artére, rougés par la carie, à la suite d'un abscess dans la thyroide.   Valsalva, Morgagni, Lieutaud ont cité de paréils exemples dans leurs ouvrages."*

I have had three opportunities of dissecting goitrous tumours. The first was in a man upwards of sixty years of age, who had laboured under a very large and tuberculated swelling of the thyroid, almost from infancy.   The tumour occupied both sides of the trachea, and was very solid, and insensible to the touch. It produced very little inconvenience, and the patient died of another complaint.   Upon dissection I found each of the enlarged lobes completely sarcomatous, without any membranous vesicles, or fluid, except a thick, yellowish, lardaceous or oleaginous matter, in small quantity, which could be pressed, by force, from the diseased mass.   Fibrous bands, similar to those which occur in the scirrhous breast, or testicle, intersected the tumour in various directions.   The larynx and trachea were not altered in structure, but the mouths of the small muciparous ducts, which open on the lining membrane of the trachea, were not perceptible, and the *tracheo-thyroideal* passages of Bordeu appeared less conspicuous than usual.

Some years ago I had an opportunity of inspecting the body of a woman thirty-five years of age, who died of apoplexy. A large tumour occupied the left side of the thyroid gland. Upon turning aside the sterno-thyroidei and omo-hyoidei muscles the gland was brought into view, and presented an immense number of varicose veins distributed over its surface; all the parts in the neighbourhood, seemed vascular in the extreme. Upon opening the gland a considerable quantity of thin greenish fluid was discharged, and the small cells which contained it were distinctly perceived.   The right side of the gland, together with the isthmus, was slightly enlarged ; but in other respects appeared to possess its natural structure.   This woman, as her husband informed me, had suffered occasionally from inordinate pulsation in the tumour, and from its pressure on the trachea, but in general experienced little inconvenience.   She was a native of Holland, where the disease commenced, about the tenth year of her age, and had slowly increased.   It appeared

* Cours d'Anatomie Medicale, tome iv. p. 564.

to have had no connexion with the complaint of which she died.

With the history of the third subject I am unacquainted   It was a girl about fourteen years old, who was much emaciated, and had laboured, apparently, for a considerable time, under constitutional disease.   Both sides of the thyroid were involved ; but the disease was evidently in its commencement.   The vessels of the gland were slightly varicose, and the cellular structure of the interior contained a small quantity of transparent fluid.   The larynx and trachea were unaltered, and the small openings of the first cartilaginous ring were distinctly observable.

The causes of goitre are involved in much obscurity.   This will account for the numerous, diversified, and contradictory speculations on the subject.   By many, the disease has been attributed to the use of particular alimentary substances, especially poor and unwholesome diet ;—to the drinking of cold or snow water, or water strongly impregnated with limestone, or other calcareous matters ; the immoderate use of spirituous and vinous liquors, debauchery, the repulsion of cutaneous diseases, and many similar explanations have likewise been resorted to ; all of which are too hypothetical, and so frequently contradicted by facts, as to deserve no attention.   It is certain, that goitre prevails as an endemic disease chiefly in countries where the atmosphere is loaded with moisture, in valleys enclosed by lofty mountains, and which are exposed to the direct and reflected heat of a powerful sun.   In some of these valleys, the fogs are visible every morning, rise with the sun in a thick body, and seldom disappear entirely until the afternoon.*   It is, however, well ascertained, that those persons who do not reside in or near the valleys where goitre prevails, but live on the sides or tops of the adjacent mountains, do not labour under the disease.   Again, it is a fact established beyond all doubt, that the mere removal of a goitrous person from the valley where he acquired his disease, to the top of the contiguous mountain, will diminish the size of the tumour, and in time remove it entirely. The same observations, perhaps, to a limited extent, may be applied to cretinism, a disease so often concomitant, but probably

* Marsden's History of Sumatra.

independent of goitre. " All the cretins, that I saw," says Dr. Reeve, " were in adjoining houses, in the little village called La Batia, situated in a narrow corner of the valley, the houses being built up under ledges of the rocks, and all of them very filthy, very close, very hot and miserable habitations. In villages situated higher up the mountains, no cretins are to be seen, and the mother of one of the children told me of her own accord, without my asking the question, *that her child was quite a different being when he was up the mountain, as she called it, for a few days.*"* Frequent opportunities are offered in this country, of observing the effects produced on goitre, by the removal of individuals afflicted with it into districts where the disease is unknown. Numerous cures, of very large goitres, have been effected in persons, who acquired the complaint at Pittsburg— simply by spending a few months in Philadelphia, or other distant places. These circumstances indicate, beyond doubt, something peculiar in the atmosphere or in the exhalations from valleys or other places where goitre is found. That the disease, at all events is not owing to poor living or to the drinking of snow water, is sufficiently proved by the circumstance of its not prevailing in certain countries where the inhabitants are accustomed to subsist on a very meagre and scanty diet. Besides,—the rich inhabitants of the Vallais and of the State of New York, are equally subject to the complaint with the poorer people. In Greenland, and Lapland, where the inhabitants use snow water almost entirely, there is no goitre, while in Sumatra, in Bambarra, and in many other warm countries, where snow is never seen, the disease is very common.†

In those parts of the State of New York, New Hampshire, and Vermont, particularly along the course of the Connecticut river, where goitre prevails, it is remarkable that the disease is most common in those places which are covered with wood and are uncultivated; but in proportion as the country is settled and the lands cleared, the disease is found to decline, and in many places is already nearly extinct.‡ In 1798, bronchocele was so common at Pittsburg, that, out of 1400 inhabitants, not less than 150 had the disease.§ Since that period, the complaint has so

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* Account of Cretinism, Edinburgh Journal, vol. v. p. 33.
† Vide Marsden, Park's Travels, Humboldt and Bonpland, &c.
‡ Mease's Observations.   § Barton's Memoir.

much declined, in the same place, that it is said very few now labour under it. The change is usually attributed by the citizens of the town, to the general introduction of coal fires. All these circumstances tend to show that bronchocele is produced by a peculiar atmosphere, or by certain morbid exhalations from marshes or other grounds. What the peculiar nature of this exhalation is, we have no more means of ascertaining, than we have of finding out the constituents and mode of action, of marsh miasma, or of the agents which create yellow fever, or any similar disease. The late Professor Barton imagined goitre to arise from the same causes which produce intermittent and bilious fevers.* But it has been ascertained that goitre originates in many districts where intermittents are unknown, and intermittents, on the other hand, are frequent where goitre has never been seen. Along the shores of the Delaware and Chesapeake bays, intermittent and bilious fevers universally prevail, and goitre is seldom found. It is possible, however, that the cause of goitre may be allied to that of intermittent, but so modified by particular circumstances, which we shall probably never be able to ascertain, as to produce very different effects. But those who are anxious for information, respecting all the supposed causes of goitre, should consult the work of Foderé, Coxe's Travels, Saussure's Voyages, Gautieri de Tyrolensium Struma, &c.

Whatever may be the remote physical causes of goitre, I am inclined to believe, that the disease arises immediately from an obstruction of the tracheo-thyroideal passages of Bordeu, of the openings communicating with the sacculus laryngeus and the thyroid gland, of which I formerly had occasion to speak, or of other passages with which we are unacquainted. I am inclined to draw this conclusion from the circumstance of a watery fluid being found to occupy naturally, the cells of the thyroid gland —from this fluid being increased in quantity in almost every goitrous tumour, and from the passages of Bordeu being much smaller in the first dissection I made of bronchocele, than they are usually met with in subjects without such disease. *This is a mere conjecture.* Neither is it original—but was advanced

* Vide Barton's Memoir—also, Caldwell's Medical and Physical Memoirs, p. 279.

by one of the older writers on surgery. I mention it, merely to induce those who have frequent opportunities of investigating the structure of bronchocele by dissection, to attend to the appearances of these passages, and to endeavour to discover other communications with the gland.

<div align="center">TREATMENT OF BRONCHOCELE.</div>

The remedies proposed for the removal of this disease are countless—the strongest proof of their inefficiency. It will be sufficient to enumerate the principal—burnt sponge, mercury, pumice-stone, muriate of barytes, sulphuret of potash, eggshells, muriate of lime, digitalis, muriate of iron, belladonna, electricity, pressure, friction, issues, setons, blisters, caustic, excision, and ligature of the thyroideal arteries. In the commencement of my practice, I employed the burnt sponge in the form of powder, mixed with honey and other materials,—the lozenges of Ring, which consist of cinnamon, gum Arabic, sirup and burnt sponge mixed—the simple decoction of the sponge, as recommended by Herrenschward of Berne, in Switzerland,—but generally without any decided effect.* In two instances, I succeeded in removing small goitres by the use of sulphate of potash, continued for several weeks in large doses. This remedy is said to have effected many cures, in the hands of Foderé and other practitioners. The different preparations of mercury and antimony, muriate of lime and barytes, I have tried without the slightest advantage. In one case, after the inefficacious exhibition of many of the remedies mentioned, the late Dr. Cromwell, of Maryland, effected a complete cure in a patient upwards of twenty years of age, who had laboured for some time under a goitre,—by the repeated application of blisters. Mr. Benjamin Bell says, that he arrested the progress of a very large bronchocele by the same means. Stimulating frictions with flannels, immersed in camphorated liniments, and other applications of a similar nature, are commended by Underwood. Foderé remarks that he frequently cured small Spanish dogs of goitre by the same

* For an account of the use of these remedies, see Foderé, p. 110; Ring, in 4th, 5th, and 11th volumes of the London Medical and Physical Journal.

means, at Maurice, where these animals are very subject to the complaint.* Frictions with mercurial ointment and various stimulating plasters, have been likewise extolled by different writers. Boyer has employed, for many years, cataplasms, or bags of emollient herbs, applied directly to the tumour, and worn night and day for weeks or months, and often with success. Compression has sometimes been found serviceable by Foderé; and the late Dr. Physick once succeeded in effecting a complete cure of the disease, in a lady of this city, by keeping up a continued but moderate pressure, by means of a bandage, for several months. Mr. Holbrook, a surgeon of Monmouth in England, where goitre is endemic, has cured a number of patients, by the use of steady pressure, after the failure of other remedies.†

But I have found no general or local remedies so efficacious as the extract of cicuta. Indeed, for several years, I have depended chiefly upon the use of this medicine, and may declare that I have seldom had recourse to it in the early stage of bronchocele, without some benefit. I found by experience, that from the age of ten or twelve years up to twenty, and in cases where the goitre was large and spongy to the touch, and had not existed very long, that the cicuta was almost a certain remedy; but, on the other hand, when it occurred in adults beyond the age mentioned, and in old people, that although it sometimes diminished the size of the swelling, yet, in general, it was productive of no advantage. The *seton*, employed so frequently by the older surgeons, and recommended a few years since, by Quadri of Naples, I tried repeatedly in the case of a German boy from Lancaster, whose neck was covered with a lobulated goitre of enormous dimensions—without any other benefit than the copious discharge of a thin greenish fluid, which diminished the tumour for a time, and relieved the patient of the uneasiness occasioned by its pressure on the windpipe.

Within the last twenty years a remedy for goitre has been introduced into practice, by Dr. Coindet of Geneva, which has excited, in a great degree, the attention of the profession in almost every European country, and in America. I allude to the preparation termed *iodine*. The reports of Coindet in favour

* Foderé, p. 115.   † London Medical Repository, vol. viii, p. 288.

of this medicine were soon fully confirmed by many other continental surgeons; and its reputation rose speedily to the highest pitch; strange as it may seem, however, its decline has been almost as rapid as its rise, being now considered, in the estimation of many practitioners, nearly inert, and by others pronounced a most virulent poison. But from all the statements made on the subject, we have, I think, fairly a right to infer, that it is a medicine of great power, calculated, in some cases, to produce a very strong impression on goitrous and other tumours, as many well attested cases decidedly show; and that, on the other hand, it is followed occasionally by tremendous symptoms, and even death. Again, it is equally certain, that upon other patients not the slightest impression has been made by its use, either upon the tumour or upon the constitution of the individuals who have taken it, sometimes for months together, and in the largest doses. My own experience in its use is very limited, but judging from this and from the reports made to me concerning it by my colleagues in the Philadelphia Hospital, I should feel inclined to doubt its efficacy. Still it is possible we may have been deceived, either by the bad quality of the medicine, or by other circumstances. Lastly, it may be stated, that Dr. Coindet himself, has abandoned the *internal* use of the remedy, and merely employs it in the form of inunction, from which he states that he has derived very beneficial results.

Bronchocele sometimes disappears spontaneously. Occasionally, the tumour is removed suddenly. Several examples of the sort are related by Alibert. In one instance, during the French revolution, a woman was seized with a fit of melancholy, and a large bronchocele, from which she had suffered exceedingly, disappeared with the utmost rapidity.*

Bronchocele may become so large as to endanger suffocation. In this case, *extirpation*, an operation first recommended by Celsus, has been resorted to, and sometimes with success. But such favourable terminations are extremely rare—as many of the older, and some of the modern French and English surgeons have sufficiently proved. Palfin, in his Surgical Anatomy, relates the case of a lady of rank in Paris, who perished from

* Alibert's Noveaux Eléméns de Therapeutique.

hemorrhage, in consequence of the removal of a large goitrous tumour, by an adventurous surgeon, who undertook the operation in spite of the remonstrances of some of the most experienced practitioners. The operator had scarcely left the house, before the hemorrhage broke out, with tremendous violence, and destroyed the patient in a few minutes.* Gooch mentions three cases, in which the operation was performed contrary to his advice, and that of some other surgeons. Two of the patients lost their lives from hemorrhage, and the third was only saved by constant pressure, kept up day and night for the space of a week, by the fingers of several persons employed for the purpose.† Mr. John Bell mentions more than one instance, where surgeons have opened tumours arising from or connected with the thyroid gland, from which the flow of blood has been so copious, as to oblige them to abandon the operation and close the wound as speedily as possible.‡ Desault, upon one occasion, undertook to remove a bronchocele from the neck of a woman, but the blood issued with such rapidity, as to force him to stop and endeavour to secure the vessels by throwing a ligature around a considerable portion of the tumour which he had dissected up. The patient died in a very short time, in convulsions, occasioned, it was supposed, by irritation from the ligatures.§ Another case is recorded of a patient who had a large bronchocele, which was productive of no inconvenience to him, removed by the knife, by the advice of Desault, and contrary to the opinion of Baron Percy and Louis. It was found impossible to stop the blood, and the gentleman expired almost immediately. Many examples of a similar nature are recorded by Bonetus, Severinus, and others of the older writers. But, perhaps, the most remarkable operation of the kind to be found in the annals of surgery, was executed a few years ago in Paris, by the celebrated Dupuytren, on a young woman who had laboured for a great length of time under an enormous bronchocele, which interrupted respiration and deglutition to such a degree as almost to destroy her. The patient had presented herself at the Hotel Dieu, in expectation of having the tumour removed by the knife. At several consultations held

* Anatomie Chirurgicale, tome ii. p. 313.
† Chirurgical Works, vol. iii. p. 158.
‡ Principles of Surgery, vol. iii.
§ Dictionnaire des Sciences Medicales, tome xviii. p. 556.

on her case by the most distinguished surgeons of Paris, it was unanimously determined, that no operation could be performed with any prospect of success. The tumour, however, still continuing to increase in size, and the entreaties of the patient for its removal becoming more urgent, Dupuytren, at last, consented to engage in the undertaking. By slow and cautious dissection he succeeded in detaching the left side of the tumour, without dividing any of the large arteries, veins or nerves of the neck. The thyroid arteries, in particular, which were very much enlarged, were each drawn out and tied with two ligatures before they were cut. The right portion of the tumour was then removed, in a similar manner, and the whole operation completed with the loss only of a few spoonsful of blood. But the patient suffered extremely, as the operation was necessarily protracted, and the dissection carried on among parts of the utmost delicacy and sensibility. She never recovered from the shock communicated to the nervous system, and expired in thirty-five hours after the operation.*

" The Archives Gen. de Med. for January, 1836, contains an account by M. Rufz of a case in which Professor Roux extirpated the thyroid gland of a young man twenty-two years of age, affected with goitre for twelve years. The tumour did not produce any serious inconvenience to the patient; nevertheless, it was determined to extirpate it. The operator seemed to have succeeded; that is, it was not followed by any of the serious primary symptoms which accompany serious wounds; but the patient died about fifty-six hours after the operation, after a short struggle. The post mortem examination revealed no appreciable cause of death independent of the wounds produced by the operation, except lobular pneumonia of the left lung."† In 1836, a surgeon in this city, performed a similar operation, without necessity, upon a young woman, who died in a short time, from hemorrhage and irritation.

It would appear, from these details, that the extirpation of even a small tumour of the thyroid gland, is attended with difficulties which should dismay the most expert and enterprising surgeon. Cases are recorded, however, where operations of the kind have been attended with success. Foderé states that

* Dictionnaire des Sciences Medicales ; also, Pelletan's Clinique Chirurgicale, vol. i. p. 215.

† Hays's Journal of American Medical Science, No. xxxviii. p. 515.

a barber relieved his wife of a very large bronchocele by
excision. The same author mentions two other instances within
his own knowledge, where Giraudi, an adventurous surgeon of
Marseilles, succeeded in curing his patient, by the same means.*
Desault dissected out the right side of an enlarged thyroid gland
of a female patient in the Hotel Dieu, who recovered without a
bad symptom in a month after the operation.† Two cases of
successful extirpation of bronchocele are detailed by Dr. Harris,
of New York. In the first case the tumour was not larger than a
pullet's egg, in the second it was of considerable size. "About
three months since," says Dr. Harris, "an application was made
to me by a lady from South Carolina. I think the bronchocele
was full as large as any I had ever seen. The tumour had been
increasing for twenty-two years. It extended from the chin,
which it buoyed up, along the trachea, until it descended an
inch, or perhaps more, under the breast bone, and spread
laterally a medial distance to each ear."‡ No hemorrhage of
consequence followed either operation, and both patients re-
covered in a very short time. There is great reason, however,
to believe, from the histories of these cases, that the tumours
neither constituted a part of the thyroid, nor were connected
with it. But, from all the information I have been able to col-
lect, on the subject of the removal of this gland by the knife, I
am inclined to believe that less danger would attend its excision,
as respects hemorrhagy, than is commonly imagined. Our
knowledge of the means of arresting hemorrhage has been
greatly improved within a few years; and it will be seen, that
Dupuytren, by adopting a practice long ago recommended and
employed with the greatest success, in this country, by Dr.
Physick (the tying of large arteries before they are cut) was
enabled to extirpate an enormous bronchocele, with the loss of
only a small quantity of blood. But I very much question the
propriety of attempting the removal of the goitrous tumour, in
any case, inasmuch as I conceive that hemorrhage is less to be
dreaded than the inflammation and irritation which follow the
operation. Under ordinary circumstances, the tumour may at-
tain a very large magnitude, without endangering the patient's
life or producing much inconvenience; and if it should increase

* Traité du Goitre, &c. p. 148.   † Surgical Works, vol. i. p. 257.
‡ New York Medical Repository, vol. xi. p. 242.

to such a degree as to render death inevitable, there is very little probability that the patient can be saved by so severe an operation as must necessarily be encountered.

But although I would not recommend the excision of the thyroid gland, there is another operation to which I would not hesitate to resort to in case of necessity. I allude to the tying up of the great arteries in the vicinity of the tumour, from which it chiefly derives support. Mr. Thomas Blizzard, of London, was the first, I believe, to execute the operation. The thyroid arteries on each side of the neck, were included in a ligature, and the tumour diminished, in the course of a week, one-third in size. The patient, however, did not recover, but died from repeated secondary hemorrhage, occasioned by an attack of hospital gangrene. But he lived long enough to evince the propriety and practicability of the operation.* In 1818, a similar operation was performed by Professor Walter, of the University of Landshut, on a man twenty-four years of age, who had an enormous bronchocele, from which he suffered extremely. The inferior thyroideal artery of the left side was taken up, and at the end of a fortnight the left portion of the tumour had diminished so much in bulk as to induce the operator to include the superior thyroid of the right side in a ligature. No inconvenience followed either operation, and the bronchocele, in a short time, almost disappeared, leaving behind only the elongated skin which hung from the neck in the form of an empty sack.†

On Bronchocele, consult A Memoir concerning the Disease of Goitre, &c., by Benjamin Smith Barton; Reeve on Cretinism, in Edinburgh Medical and Surgical Journal, vol. v.; Foderé, Traité du Goitre et du Cretinisme; Dictionnaire des Sciences Medicales, vol. iii.; Gooch's Chirurgical Works, vol. ii.; Baillie's Series of Engravings to illustrate Morbid Anatomy; Alibert's Nosologie Naturelle; Gibson on Bronchocele, in vol. i. of the Philadelphia Journal of the Medical and Physical Sciences; An Essay on the Effects of Iodine on the Human Constitution, with Practical Observations on its Use in the Cure of Bronchocele, Scrofula, and the Tuberculous Diseases of the Chest and Abdomen, by W. Guirdner, M.D., 8vo., London, 1824; Medical Researches on the Effects of Iodine, in Bronchocele, Paralysis, Chorea, Scrofula, Fistula Lacrymalis, Deafness, Dysphagia, White Swelling, and Distortions of the Spine, by Alexander Manson, M. D.

* Burns's Surgical Anatomy, p. 202.
† Bulletin de la Société Medicale d'Emulation, 1818.

SECTION VI.

TORTICOLLIS, OR WRY NECK.

From exposure to cold, from rheumatism, twists of the neck, or strains of the platysma-myoides, and sterno-mastoid muscles, from the cicatrices of burns, &c., the head is sometimes drawn to one side, or towards the shoulder or sternum, in such a way as to produce great deformity. Occasionally, the disease arises from paralysis; in other instances, it proceeds from some defect or malformation of the vertebræ of the neck. The clavicular is oftener affected than the sternal portion of the sterno-mastoid muscle; each, however is liable to be converted into a substance resembling gristle. The whole of the muscle also is shortened, has an indurated, stringy feel, and is painful to the touch. Great pain is frequently experienced upon attempting forcibly to restore the head to its natural position.

TREATMENT OF WRY NECK.

When the disease depends upon paralysis of the muscles, or upon malformation of the vertebræ, it may be looked upon, generally, as incurable; but when it arises from morbid contraction of the fibres of the platysma-myoides, or sterno-mastoid muscles, an operation will, in many instances, effect a cure. It should be done in the following manner. The patient is seated on a chair, and his head supported by an assistant standing behind him. An incision is then made two or three inches long, in the course of the muscular fibres, through the integuments; and the contracted portion having been fairly exposed, the handle of a knife,—or a small curved spatula,—is carried behind it, in order to protect the vessels beneath. By one or more cuts of a bistoury, the muscle is next separated, and when this is effectually done, the head may be immediately, in most cases,

restored to its natural situation.* Very frequently it happens, that several strings of muscular fibres, in different places, require to be cut across. In such cases, the surgeon must persevere until he has loosened the whole. After the operation, the head should be supported in its proper place by bandages, or a stock of leather, and the edges of the wound, for some time, kept separated by lint. Sometimes, especially in females, it may be deemed expedient, in order to obviate deformity arising from the cicatrix, to pinch up the contracted portion of the muscle, along with the skin covering it, and divide it with a narrow and sharp-pointed bistoury. Dupuytren has related a case in which he succeeded perfectly by adopting this plan. Professor Jorg, of Leipsic, has attempted the cure of wry neck by machinery, and sometimes, it is said, with success.

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On Wry Neck, consult C. Bell's Operative Surgery, vol. i.; Gooch's Chirurgical Works, vol. ii.; Sharp's Treatise on the Operations of Surgery; B. Bell's System of Surgery, vol. v.; Boyer's Traité des Maladies Chirurgicales, tom. vii.; Kirby's Cases, with Observations on Wry Neck, &c.; Cooper's First Lines of the Practice of Surgery, vol. i. p. 558, in which will be found an Engraving and Description of Jorg's Apparatus.

* I performed an operation, several years ago, upon a girl, sixteen years of age, whose head had been drawn for several months towards the right shoulder, from a contraction of the clavicular portion of the sterno-mastoid muscle. As soon as the muscle was cut across, the head was instantly restored to its natural position, and has remained so ever since.

CHAPTER IV.

DISEASES OF THE THORAX.

Gun-shot and other wounds of the chest, emphysema, col-
lections of purulent matter, and of blood, mammary abscess,
carcinoma of the breast, fractures of the ribs and sternum,
aneurism of the aorta, caries of the spine, having been
already treated of in other places, it only remains to notice
hydrothorax, and to describe the operation necessary for its
removal, after the physician has exhausted his skill in the trial
of medicines.

SECTION I.

HYDROTHORAX, OR DROPSY OF THE CHEST.

This disease is either idiopathic or symptomatic. The
former is very rare, the latter frequent. Idiopathic hydrothorax
generally occupies one side of the chest only, and is frequently
unaccompanied by dropsy in other parts of the body. The
pleura itself is seldom much diseased, and merely contains a
serous fluid. The lung of the affected side is collapsed, and the
patient complains of great difficulty of breathing.

Symptomatic hydrothorax is exceedingly common, and is
characterized by the following symptoms. The patient finds
it difficult, if not impossible, to lie in the horizontal position,
or on the unaffected side. His respiration is hurried and
laborious, pulse irregular, thirst incessant, urine diminished and
high-coloured. In addition to these symptoms, a troublesome
cough and palpitation of the heart usually attend the disease.

One of the most certain symptoms, however, is a sensation resembling the movement of water within the chest. This particular sensation may often be discovered by the surgeon himself, while the patient is in the erect position, by forcibly striking the chest, and still better by the use of the stethoscope. A collection of water in the pericardium may give rise to all the symptoms of common hydrothorax. Sometimes both sacs of the pleura are filled with fluid. In other instances, the cavities are occupied by hydatids. The most common causes of symptomatic hydrothorax, are intemperance, gout, asthma, anasarca, pleurisy.

PARACENTESIS THORACIS.

This operation is seldom resorted to until the case is hopeless—a sufficient explanation of the unfavourable termination that generally awaits it. When performed early, however, and under favourable circumstances, it is calculated to afford great relief, even if it should fail to remove the disease. The situation most favourable for the evacuation of the fluid, is between the sixth and seventh ribs, counting from above downwards. Having placed the patient nearly in an upright position, with his back supported by pillows or by an assistant, and the head and shoulders directed backwards, the surgeon makes an incision three inches long, with a small scalpel or bistoury, through the integuments, cautiously penetrates the layers of the intercostal muscles, (keeping close to the upper edge of the seventh rib to avoid the intercostal artery,) and makes an opening through the pleura large enough to admit a full-sized cannula or gum elastic catheter, which should be introduced as soon as the water begins to flow. Care must be taken, however, not to push the cannula too far, lest its extremity irritate the lungs, and excite coughing. This happened to me during the winter of 1824, in the Philadelphia Hospital, in a case of hydrothorax under care of Dr. Jackson, and brought on immediately a most severe cough, that distressed the patient exceedingly. If a very large quantity of fluid has collected, it will be improper to remove the whole of it at a single operation—lest the patient suddenly die from the pressure being taken off from the heart and lungs.

When both sides of the chest are occupied by the fluid, an ope-
ration will be required on each side; but they should never be
performed simultaneously, inasmuch as the lungs generally col-
lapse as soon as the chest is opened, in which case the patient
must necessarily die. After the fluid has been evacuated the
lips of the wound should be closed by sticking plaster, and
made to unite. Should the water accumulate again, as it often
does, the operation may be repeated. " The operation for em-
pyema, or paracentesis, is seldom resorted to in this country, or
England," says Dr. Jackson, " for the relief of morbid effusions
into the chest. Though of greater frequency on the continent
of Europe, yet, in comparison with the practice of former periods,
it appears to be falling into disuse. The nature of these effu-
sions, and their causes are widely different. The operation is
not calculated to afford equal benefit in all cases in which they
exist, while, in many, it is wholly useless. From a recurrence
to it without discrimination, it has, no doubt, often proved of no
service, and may have been sometimes of disadvantage; and,
in consequence, the benefits that may be obtained from the
apposite performance of this operation, have been too much
underrated. Many striking instances of unequivocal relief, and
some complete cures in desperate cases, are on record, as having
been obtained by these means; nor can it be questioned, that,
employed with judgment, it will seldom fail to afford relief from
distressing symptoms, will often protract life, and, sometimes,
prove auxiliary to the completion of a perfect cure. The opera-
tion itself is simple, unattended with much hazard, being but little
more formidable than the opening of a large abscess, and, when
an effusion into the chest is clearly indicated, may, with perfect
propriety, be performed, merely with a view to alleviate the
distress and suffering of the patient, even when it holds out no
expectation of an ultimate recovery."

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See B. Bell's System of Surgery, vol. v. p. 188; Laennec on the Diseases of
the Chest; S. Cooper's First Lines of the Practice of Surgery, vol. i. p. 584;
Archer's Case of Paracentesis, in vol. i. of Transactions of the King's and Queen's
Colleges of Physicians in Ireland; Jackson's Case of Effusion into the Chest, in
which Paracentesis was performed, in the Philadelphia Journal of the Medical
and Physical Sciences, vol. x. p. 19.

CHAPTER V.

DISEASES OF THE ABDOMEN.

WITH few exceptions, the surgical diseases of the abdomen are as numerous, diversified and important, as those of any other part of the body. Many of them, too, are extremely intricate, and will require all the student's industry and skill to unravel them. This is strikingly the case with hernia, which, from the complicated anatomical relations of that disease, its extraordinary frequency, the numerous varieties of the complaint, the distinct modes of treating each, recommended by some surgeons, and condemned by others equally eminent, the necessity, upon many occasions, for delicate operations, called for, often, upon the spur of the occasion, and without a moment's warning, should be sufficient, as a distinguished writer has remarked, "to infuse fear into the heart, and agitation into the conscience of all who presume to call themselves qualified surgeons, without having first duly considered every thing relating to so important a branch of their profession."

In the ensuing sections, I propose to consider dropsy of the belly, poisons in the stomach, and the principal varieties of hernia. Abscess of the liver, aneurism of the abdominal aorta, lumbar abscess, and wounds of the abdomen, have been already treated of in their proper places.

SECTION I.

ASCITES, OR DROPSY OF THE ABDOMEN.

In the commencement, this disease is marked by difficulty of breathing, cough, dryness of the skin, constipation of the bowels, diminished secretion of urine, loss of appetite, prostration of strength. These symptoms are soon succeeded by general fulness of the abdomen, and by a sense of fluctuation easily perceived by laying one hand on the belly, and striking it with the other.

Ascites, for the most part, is the consequence of organic disease of the viscera of the abdomen, particularly scirrhus of the liver, pancreas, or spleen. Sometimes it arises from an accumulation of water in the cavities of the pleura or pericardium, at other times it follows an enlargement of the mesenteric glands. In general, the fluid is contained in the sac of the peritoneum, and sometimes accumulates in prodigious quantity.

PARACENTESIS ABDOMINIS.

By the internal use of volatile tincture of guaiacum, squill, gamboge, calomel, digitalis, elaterium, and other similar medicines, I have frequently succeeded in removing, entirely, dropsy of the belly. The disease, however, often terminates fatally for want of timely operation. There are two situations in which this may be performed—midway between the spine of the ilium and umbilicus, or in the linea alba. The former has of late years been mostly abandoned, owing to the thickness of the muscular parietes, and to the epigastric artery, from irregular distribution, having sometimes been wounded. A trocar, either rounded or flat, is the instrument commonly used in this operation; or a common lancet may be employed, as advised by Dr. Physick. Preparatory to the operation, the abdomen should be

surrounded by a piece of flannel, broad enough to cover its whole surface, and sufficiently long to go twice round, the ends of which are split in three or four places. The middle of the bandage is placed over the front of the abdomen, and the ends are crossed upon each other, and left hanging on each side. Having marked the spot in the linea alba best adapted to the operation—about two or three inches below the umbilicus—the surgeon makes a slit in the flannel, corresponding to the part, and through this penetrates with the trocar or lancet, the integuments, tendons, and peritoneum. The instrument being withdrawn, the water instantaneously follows the puncture, and in proportion as it flows, assistants placed on each side of the patient tighten the flannel by pulling at its ends. This serves the purpose of keeping up the general support of the abdomen and prevents the patient from fainting. If a very large quantity of fluid has accumulated, it may, perhaps, be imprudent to draw it all off at once, lest the patient be too much exhausted. On the contrary, the better plan will be to close the orifice from time to time, until the whole is evacuated; after which, the opening may be permitted to heal. Should the surgeon prefer a common lancet for the operation, he must be prepared with a flat cannula, corresponding to the size of the instrument, and introduce it into the opening immediately after the lancet is withdrawn. Sometimes the flow of water is suddenly interrupted by the intrusion of a particle of fat within the cannula. When this happens, the obstacle should be removed by a probe. The operation of paracentesis abdominis, is one which in general requires frequent repetition. Incredible quantities of fluid have been drawn from some patients at once, or at separate operations. Many patients sink under the disease in a few weeks or months; others live for as many years, and experience temporary relief from operations. A few recover perfectly.

It sometimes happens that *pregnancy* so closely resembles abdominal dropsy as to be mistaken for it, and cases are related in which the uterus has actually been tapped. The following remarks on this subject by Sir Astley Cooper are well calculated to put the young surgeon on his guard. Speaking of encysted dropsy, he says, " I will here mention two circumstances, in one of which my character was exposed to considerable risk; of the other I was informed by a medical man who was invited to wit-

ness the operation. In the first case I was desired to see a lady who I was told laboured under dropsy. When I entered the room I saw a thin delicate female, with an immense abdominal swelling, giving a distinct sense of fluctuation. I requested the physician accoucheur, whom I met, to examine if the lady was not with child; he said he thought it was unnecessary, as the fluctuation was very distinct, but that he would do so and let me know the result in a few days. I heard no more of her for a week, and then I learned that she had been put to bed on the morning following my visit. I would not have performed the operation of paracentesis for the universe. The circumstances which were told me of the other case were as follows: a surgeon in a country town called upon another surgeon, and said, 'I am going to tap a woman to-morrow ; perhaps your young gentlemen would like to be present.' As it was an operation they had never witnessed, they most readily accepted the invitation: they were shown into a room in which the patient was already prepared to undergo the operation; she was sitting at one end with her abdomen bare. The surgeon then taking his trocar and cannula, went to some distance, and walking up to the patient with the trocar presented, he charged, as it were with a bayonet, and plunged it into the abdomen ; then withdrawing the trocar with an air of triumph, it was with no small chagrin he found not a drop of water escape ; but, however, still undismayed, he withdrew the cannula, and again renewing his attack, he a second time introduced the trocar into the abdomen, but was equally as unfortunate as before, in finding that no water followed. Waiting a few moments, he withdrew the cannula, and turning round to the gentlemen, he said, ' You may do her up ;' by which he meant they might apply the bandages; and he added, ' This, gentlemen, is an operation which you probably never saw before, and which most likely you may never see again. This is what we call the operation of dry tapping !' "*

The encysted, or ovarian dropsy, differs essentially in character and situation from common ascites. The latter is contained in the bag of the peritoneum, in the greater number of instances, in contact with the intestines; the former is confined to the ovarium, and originally contained in separate cells, the

* Sir A. Cooper's Lectures on Surgery, by Tyrrell, vol. ii. p. 378.

partitions of which are afterwards broken down or absorbed. A few of these cells, however, generally remain. The fluid of ovarian dropsy, also, is not commonly so thin and transparent as that of ascites. It is generally thick, tenacious and turbid, of a brown or yellow colour, and often resembles sero-purulent matter. From an enormous tumour of this description, which I opened some years ago, were discharged several gallons of fluid, of the consistence and colour of honey. But, in other cases, I have drawn off large quantities of perfectly transparent serum. When the ovarian dropsy becomes so extensive as to occupy the abdomen, it is very difficult to distinguish it from ascites; but after an operation the walls of the ovarium can be distinctly felt, in shape of a tumour large as a child's head, on one side of the abdomen.

See C. Bell's Operative Surgery, vol. i. p. 318; Dorsey's Surgery, vol. ii. p. 364; Sabatier, Medecine Operatoire; Boyer's Surgery; Larrey's Memoirs; Barlow, in Provincial Medical and Surgical Transactions, vol. iv.; Seymour's Illustrations of Diseases of the Ovary; Buchanan, in Glasgow Med. Journ. vol. i.; Darwall, in Cycloped. of Pract. Med.

SECTION II.

POISONS IN THE STOMACH.

ACCIDENTALLY, or by design, poisons are often taken into the stomach, and, according to their particular quality and quantity, produce, in greater or less time, violent symptoms or death. Poisons from the mineral, vegetable, and animal kingdoms, are all capable of these effects. With few exceptions, however, mineral poisons are more active and deleterious than either vegetable or animal. The principal mineral poisons are arsenic, corrosive sublimate and some other preparations of mercury, acids and alkalies, lead, tartrite of antimony, and lunar caustic. These, when taken into the stomach, operate by exciting violent inflammation, or by producing excessive vomiting, palsy, or convulsions. Arsenic and corrosive sublimate give rise nearly to the same symptoms; these are swelling of the tongue, extreme thirst, a burning sensation throughout the gullet, violent spasmodic pain in the stomach and intestines, incessant vomiting and purging, and the evacuation of viscid mucus mixed with blood. If relief be not speedily afforded, cold sweats, faintings, twitchings of the limbs succeed and destroy the patient in a few hours. When examined after death, the stomach and œsophagus exhibit marks of violent inflammation, and are sometimes perforated with numerous holes.

Among the *vegetable* poisons most deleterious, may be enumerated opium, cicuta, aconitum, hyoscyamus, digitalis, belladonna, hellebore, savin, laurus cerasus, and many varieties of fungus or mushroom. These, when introduced into the stomach in large quantity, occasion palpitation of the heart, stertorous breathing, vertigo, dimness of sight, torpor, distention of the stomach, convulsions and death. In addition to these symptoms, opium and laudanum, in large doses, have the peculiar power of inducing profound sleep, which generally terminates in apoplexy, paralysis, or death.

The *animal* poisons capable of producing violent symptoms,

or fatal consequences, by being taken into the stomach, are comparatively few in number. The principal are cantharides, and certain varieties of fish. Prussic acid, which belongs both to the animal and vegetable kingdoms, is a most subtle poison, and, sometimes, even in very small quantity, produces instantaneous death. Cantharides is more protracted in its operation, but is capable of producing tremendous symptoms, and not unfrequently proves fatal. Some poisonous fish, when eaten, destroy life in a few hours. Such fish are by no means uncommon in some parts of the West Indies. Those reputed the most deleterious are the yellow-billed sprat, dolphin, the rock fish, barracuda, smooth bottle fish, the king fish, gray snapper, the white land crab, and conger eel.

TREATMENT OF POISONS IN THE STOMACH.

When the nature of the poison taken in the stomach can be ascertained, it may be possible sometimes, by antidotes, to obviate its deleterious effects. A large quantity of albumen, or white of eggs, for example, is looked upon as the proper corrective for corrosive sublimate; lime-water, charcoal, or carbonate of magnesia, for arsenic; muriate of soda for lunar caustic; calcined magnesia for the mineral acids; acetic acid for the alkalies. It must be understood, however, that in general neither these nor any other articles* of similar description are calculated to produce very beneficial effects, and that our reliance must be placed, mainly, upon speedy and copious vomiting, and upon the removal of the poison by means of the gum elastic tube and syringe. The last is a remedy of modern origin, and one of immense importance. By whom the idea was first suggested, is not positively known. Renault, however, in his work on poisons,† expressly recommends an apparatus (somewhat similar to the one now in use) for removing arsenic from the stomach. Dr. Monro, afterwards, in his thesis,‡ gave drawings of instru-

* From experiments, recently made on the human subject, and other animals, there is great reason to hope that the *hydrated peroxide of iron*, will be found a perfect antidote to arsenic.

† Experiences sur les contre Poisons de l'Arsenic, 8vo.

‡ De Dysphagia, p. 95, Edin. 1797.

ments for the removal of laudanum from the stomach, and at the
same time published a case in which the experiment had been
tried—though without success. " Quo laudani effectus leniores
essent ei in vetriculum, instrumento in tab. XIV. depicto, per
magnam aquæ tepidæ quantitatem injeci, faucibus simulper ori-
speculum diductus."*   It remained, however, there is reason to
believe, for Dr. Physick to prove the utility of the invention ; for
until the successful issue of the experiment performed by him
in 1812, on a child of three months old, poisoned by laudanum,†
little importance was attached by the profession either to
Renault's or Monro's proposal.   Since that period, every
apothecary's boy in Philadelphia has become fully acquainted
with the operation, which, perhaps, has been performed hundreds
of times, with the most favourable result.   Strange as it may
appear, European, or at least British surgeons, are just becoming
acquainted with the practicability of the operation, for we find
from the statements of a Mr. Read, and from remarks in the
periodical work called the " Lancet," that the proposal has
been considered by Sir Astley Cooper, Messrs. Scott, Jukes, and
other surgeons, as perfectly novel, and this so late as the year
1822 ! !

When called to a patient suffering from poison, whether cor-
rosive sublimate, arsenic, or any other article of the kind, the
surgeon should resort immediately to a powerful emetic, and, if
this does not answer, to the gum elastic tube, (an instrument
about two feet in length, and three-eighths of an inch in diameter,)
and by means of a common pewter syringe applied to its upper
extremity, inject into the stomach a quantity of tepid water.
The water, mixed with the contents of the stomach, should be
immediately afterward withdrawn, and a fresh supply thrown
in, and by this alternate injection and evacuation, the stomach
may in a little time be thoroughly scoured out, the poison
removed, and the patient recovered—provided there has not
been too great delay.   The common syringe and tube I prefer
to the more complicated and expensive instruments of Jukes and
Read—after repeated comparative trials with each.   Of late
years, however, several instruments for pumping out the stomach
have been invented, less complicated and more effectual than

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* De Dysphagia, p. 95.   † See Eclectic Repertory, vol. iii. p. 111.

the ones just referred to. In particular, a syringe invented by Dr. C. Matthews,* of this city, is worthy of the praise which has been bestowed upon it. English surgeons, especially, I presume, must have been pleased with it; for soon after an account had been published of it in the London periodicals, Mr. Weiss, a celebrated cutler, manufactured one upon the same principle exactly, but without reference to the source from which he, probably, derived it. Mr. Weiss's pump has since been introduced into general practice, and is, certainly, a very beautiful, simple, and useful instrument.

Consult Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 79 ; Thomas's Modern Practice of Physic, 7th edit. p. 311 ; Dictionnaire des Sciences Médicales, tom. xliii. p. 525 ; Orfila on Poisons ; Chisholm on the Poisons of Fish, in vol. iv. of the Edinburgh Medical and Surgical Journal, p. 393 ; Brodie's Observations on the Action of Poisons on the Animal System, in Transactions of the Royal Society of London, 1812 ; Bostock's Experiments, showing that a Mineral Poison may produce sudden and violent Death, and yet be incapable of Detection in the Contents of the Stomach, in Edinburgh Medical and Surgical Journal, vol. v. p. 14 ; Account of a New Mode of extracting Poisonous Substances from the Stomach, by P. S. Physick, in the Eclectic Repertory, vol. iii. p. 111 and 381 ; Read's Appeal to the Medical Profession, on the Utility of the Improved Patent Syringe, &c. ; Lancet, vol. i. No. viii.

* See American Medical Recorder for 1826.

SECTION III.

HERNIA.

A PROTRUSION of any of the abdominal viscera, covered by the peritoneum, through natural or preternatural apertures in the tendinous or muscular parietes, may be denominated hernia. The term has been extended, though improperly, to several other diseases bearing no analogy to the one under present consideration.

Hernia is a very common disease; so much so, that one-eighth of mankind, it has been imagined, is troubled with it—a proportion, however, immensely overrated. Certain general appellations, expressive of the particular condition or contents of a hernial tumour, are employed by most modern surgeons— reducible, irreducible, and strangulated hernia, enterocele, epiplocele, and entero-epiplocele. By *reducible* hernia is understood a tumour easily replaced by pressure, or by laying the patient in the horizontal position, but descending again as soon as the pressure is discontinued, or the upright posture resumed. The term *irreducible* hernia implies permanent protrusion from adhesion between the sac and its contents, or from extraordinary bulk. *Strangulated* hernia is that state of the disease in which the parts are confined by stricture, and are liable to mortify, unless the stricture be speedily removed. When the protrusion consists of intestine alone, the disease is denominated *enterocele;* when it contains omentum merely, it is called *epiplocele;* and, if intestine and omentum together, *entero-epiplocele.* Herniæ are, also, designated according to the situation they happen to occupy. Thus, we have *bubonocele* or inguinal hernia, *oscheocele* or scrotal hernia, *merocele* or crural or femoral hernia, *exomphalos* or umbilical hernia, congenital hernia, ventral hernia, ventro-inguinal hernia, and several other varieties of comparatively rare occurrence.

Every hernia is furnished with a peritoneal investment, or *sac;*

this is pushed before the protruded viscera, and passes through a natural or preternatural opening, to the margins of which it speedily forms an intimate adhesion.   That portion of the sac communicating directly with the abdomen is called its *mouth ;* its lower extremity or that most remote from the internal sur- face of the belly its *fundus*, and the part immediately sur- rounded by the aperture in the tendinous parietes, its *neck.* The sac, although originally thin as the rest of the peritoneum, soon acquires an increased thickness, and in hernia of long standing, is sometimes greatly condensed.   On the other hand, it is frequently found attenuated to an extreme degree, or entirely wanting—as the result of absorption.   That it is sus- ceptible of extreme extension, is proved by those enormous hernial tumours, so common in very warm climates, and some- times met with in this country.

The *causes* of hernia are very numerous, and are either ex- citing or predisposing.   Severe exercise on foot, or on horse- back, lifting heavy weights, playing on wind instruments, vomiting, costiveness, stricture of the urethra, the hooping- cough, crying, parturition, tight clothes, jumping, often produce the complaint either immediately or remotely.   Among the pre- disposing causes of the disease, hereditary conformation and preternatural laxity of the abdominal apertures, may be consi- dered the most common.

Reducible hernia is distinguished from other varieties of the disease by the following symptoms.   The tumour, as already mentioned, descends in the erect, and retires within the abdomen during the recumbent position, or when pressure is made upon it.   If the sac should contain intestine, a peculiar rumbling or gurgling noise will be perceived both by the patient and surgeon, at the moment the gut slips into the abdomen.   The tumour will also be tense and elastic to the feel.   Omentum, on the contrary, communicates to the finger a doughy sensation, and is with greater difficulty restored to the abdomen.   Besides these indi- cations a reducible hernia may be distinguished from other diseases by the circumstance of its being larger after a meal than when the stomach and intestines are empty, and by an im- pulse being communicated from the tumour to the surgeon's finger when the patient is directed to cough.   If suffered to in- crease, the reducible hernia may in time become enormously

large, and the patient will not only experience great disorder of
the digestive organs, but his life will be endangered by strangu-
lation of the gut.

Irreducible hernia may arise from three different causes—
from adhesion between the sac and its contents—from the for-
mation of membranous bands across the sac—and from an ex-
traordinary enlargement of the omentum, or great increase in
volume of the intestines. The last two causes are more common
than the first. Effusion of lymph upon the inner surface of the
sac, and upon the outer surface of its contents, gives rise to the
bands that intersect the intestine and omentum, and fasten them
at different points to each other. When the omentum has
resided for a long time in a hernial sac, it is apt to become
enlarged and indurated, and in this state cannot pass through
the neck of the sac and be restored to the abdomen. Some-
times a mass of hardened omentum serves as a truss, and pre-
vents the descent of the intestines. Slow inflammation, from
neglect, from blows upon the tumour, and other injuries, is the
most frequent cause of hernia being changed from the reducible
to the irreducible state.

The symptoms of *strangulated* or incarcerated hernia, are,
in most instances, so strongly marked, as to admit of no decep-
tion ; yet it happens, now and then, that the disease is confounded
with *ileus* and other intestinal affections. If, from irregularities
of diet, especially the free use of flatutent vegetables, violent
corporeal exertions, injuries, the accumulation of worms in the
intestines,* or other causes, the contents of a reducible or

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* A remarkable instance of this kind occurred several years ago in Southwark.
A woman between seventy and eighty had been subject from infancy to worms,
which were so numerous as to be discharged per anum and thrown up from the
stomach upon many occasions. She had laboured, also, for many years, under
irreducible femoral hernia, and at last was seized with symptoms of strangulation.
Drs. Anderson and Wallace being called to her assistance, tried in vain to effect
reduction by taxis, and requested me to see her. There being no other alternative
I performed the operation, and upon opening the sac discovered the intestine to
be filled with a solid substance, which, upon being pressed and handled, was
found to consist evidently of worms ; for as soon as the stricture was divided,
vermicular motion was perceptible and in a little while the animals being relieved
from their imprisonment, returned to the abdomen, and the gut being left flaccid,
was easily reduced. The operation, however, had been delayed too long : morti-
fication took place, and through openings in the sphacelated bowels numerous
worms the next day escaped by the external wound. Upon post mortem exami-

irreducible hernia should become constricted, the fæcal evacu-
ations will be suppressed, the patient will complain of general
soreness of the abdomen, of pain around the navel, resembling
the sensation produced by a tight cord, of sickness at the
stomach, and of severe pain in the tumour itself. To these
symptoms are speedily added, vomiting of bilious, or sterco-
raceous matter, hiccup, a quick, hard pulse, an increase of
tension in the abdomen, cold sweats, and great anxiety of
countenance. If by this time the patient does not experience
relief, a remarkable change in the symptoms will soon take
place. The pulse becomes small and thready, the patient feels
suddenly easy, the tumour when pressed upon crackles beneath
the fingers, and assumes a leaden colour. To these succeed
enormous distention of the abdomen, a fluttering, intermittent
pulse, and death. When examined by dissection, the intestine
will be found of a dark brown or chocolate colour, interspersed
with black or mortified spots, and coated in particular places
with a brownish or bloody lymph. The omentum is seldom
altered in appearance. The sac contains, in proportion to its
size, and the duration of the strangulation, more or less of a
bloody fluid. At the strictured part, the intestine is generally
ulcerated or detached. Throughout, the peritoneum exhibits
marks of high inflammation, and in numerous places the intes-
tines are glued together, and their surface streaked with red
vessels. It might, perhaps, be supposed that a stricture upon
the omentum *merely*, would not give rise to constipation and
the other symptoms of strangulation above enumerated. Expe-
rience, however, proves the contrary. With regard to the
length of time strangulation may continue, much will depend
upon the duration and size of the tumour, and upon its contents.
Recent and small herniæ, generally speaking, are more
dangerous, and terminate sooner, when strangulated, than
the old and large. An intestinal hernia, also, runs its course
quicker, and is more violent in its symptoms than an omental
hernia. Some strangulated herniæ prove fatal in six or eight
hours ; others continue for as many days. The disease, when

nation hundreds of these animals were found in the intestines. My friend Dr.
Isaac Thomas of West Chester, a most intelligent and experienced physician, has
detailed in the American Medical Recorder a similar example of *ileus* produced by
the same cause, and which also terminated fatally.

left to itself, is not invariably mortal. On the contrary, the parts exterior to the stricture, in some instances, mortify, and are thrown off in the form of slough, an artificial anus is established, and the patient recovers. The seat of the stricture in strangulated hernia must depend upon the particular situation the hernia happens to occupy.

GENERAL TREATMENT OF HERNIA.

Reducible, irreducible, and strangulated herniæ all require distinct and particular modes of treatment.

For reducible hernia, an appropriate *truss* is the only remedy, and the sooner this is applied the better. Formerly an opinion prevailed that such instruments were not adapted to infants ; the error has been amply rectified by modern experience, and much mischief thereby prevented. Trusses are either elastic, or non-elastic : the latter are now seldom employed, and never can be to advantage. A well constructed steel truss often effects a perfect cure, especially in children and young subjects, by exciting a degree of inflammation sufficient to agglutinate the sides of the sac, or the edges of the opening through which the hernia, has passed. To accomplish this purpose, great attention must be paid by the surgeon in adapting the instrument to the parts, and by the patient in wearing it without intermission. The best mode of fitting a patient with a truss, is to try a number of instruments, and select the one that adapts itself best to the hollows and projections about the abdomen and pelvis, and can be worn with the least inconvenience. When no opportunity of selection offers, a measure may be taken by means of an annealed wire, doubled and passed around the body, taking care to leave the wire an inch or two longer than the size of the patient—to allow for the stuffing of the instrument. A well contrived truss will fit accurately in every part, and set closely to the body, neither bulging in particular places, nor binding too closely. Every patient should be provided with a spare truss—in case of accident. To prevent the pad of the truss from imbibing perspiration and becoming hard, a bit of calico, muslin, or rabbit skin should be placed between it and the tumour. With a view, also, of obviating rust, to which the spring is very liable, the

instrument may be thickly covered with durable leather, or some
similar material, and with oil-cloth, or gum elastic, when the
patient has occasion to bathe. A truss, to derive full benefit
from it, must be worn night and day, and for months and years
together. Particular varieties of truss will be noticed when the
different species of hernia are described. I may mention here,
however, that my friend Dr. Chase, a young and enterprising
surgeon, who has paid particular attention to the construction
of trusses, and has, in fact, for the last four or five years,
devoted himself almost exclusively, to the radical cure of
hernia, and to the treatment of deformities, has made great im-
provement in such instruments ; and, indeed, has already brought
them to a degree of perfection that could not have been antici-
pated a few years back.

Irreducible hernia, particularly that variety of it dependent
upon adhesion between the sac and its contents very seldom
admits of relief. Cases are recorded, however, by Arnaud,
Ledran, and Hey, of the diminution and final restoration to the
abdomen, of immense hernial tumours, by low diet, blood-letting,
purging, and confinement, for many months together, to the
horizontal position. In most cases, a suspension of the tumour
by a bag truss, and strict attention to diet, are all that can be
done.

For *strangulated* hernia, various remedies have been em-
ployed—such as blood-letting, purging, the cold and warm
baths, opium, fomentations, and poultices, the application of
cold, the taxis, tobacco injections, and an operation. The three
last only are to be relied upon. By *taxis* is understood an
effort to restore the protruded intestine or omentum, by manual
pressure, to the cavity of the abdomen. This should be
attempted always before any other plan, and is frequently suc-
cessful. To increase the chance of success, the surgeon must
endeavour to relax the abdominal muscles as much as possible—
by elevating the shoulders and pelvis with pillows, bending the
patient's legs on his thighs, and his thighs on the pelvis, and at
the same time drawing them towards each other. Upon the
tumour, steady, but not violent pressure should then be ex-
erted and kept up unremittingly with the fingers or hands
for half an hour. If this fail the taxis must be discontinued,
lest it increase the inflammation in the protruded parts. That

this operation of *taxis* often hurries on the mortification, or bursts the intestine, there can be no doubt, especially when the patient happens to fall, as in hospitals, into the hands of young and inexperienced house pupils, who think it right to make strenuous exertions in this way, before they send for the attending surgeon.

Dr. Sewall, of Washington, in several cases of strangulated hernia, reported in the fourth volume of the American Journal of the Medical Sciences, has extolled the use of spirits of turpentine; and Dr. Obrein, of Dublin, has lately called the attention of the profession to the mechanical use of gum elastic tubes, introduced into the rectum and carried as high as possible; but this practice, which I myself have employed for the last ten years with considerable benefit in numerous cases of ileus and strangulated hernia, originated, there is reason to believe, with Dr. Chapman, who, more than thirty years ago, in consultation with the late Dr. Bensell, of Germantown, succeeded in saving a patient by the introduction of a long and large wax candle that happened to lie on the mantelpiece.

The surgeon, having failed in all these expedients, may next have recourse to the tobacco enema, which, (as it is a very powerful and dangerous medicine, if incautiously administered,) should be carefully prepared by infusing a dram of tobacco in a pint of boiling water for a quarter of an hour. When cool, the liquor may be strained, and one-half of it thrown up the rectum by a syringe, and the remainder half an hour afterwards, should the first prove insufficient. The effect of tobacco, thus administered, is to prostrate the system, excite the action of the intestines, and relax the abdominal muscles. As soon as these ends are accomplished, a slight effort, in the way of taxis, will often succeed in overcoming the stricture, and in restoring the parts to the abdomen. If the tobacco fail, the knife is our only resource; but in the use of this, the surgeon must be governed by the particular seat of the hernia—as will be explained in the ensuing sections.

SECTION IV.

INGUINAL HERNIA.

AFTER the general account given of hernia and its treatment, it will be proper to consider the varieties of the disease, the principal of which are inguinal, crural, umbilical, and congenital hernia. To each of these, it will be necessary to prefix a short account of the surgical anatomy of the parts.

When the integuments of the abdomen are turned back, a thin but compact sheet of cellular substance, described by modern anatomists under the name of *superficial* fascia, will be found to cover the whole surface of the abdominal muscles. Not only does it cover these muscles and their tendons, but extends upwards to the chest, and downwards to the thighs, and, in fact, may with propriety, perhaps, be said to form a sort of general investment to the body. Its attachment to Poupart's ligament, and to the surface of the spermatic cord, is particularly close. On the surface of the fascia, and running over Poupart's ligament towards the umbilicus, an artery and vein may be observed. These are branches of the external pudic, and from being concerned in the operations for strangulated inguinal and crural hernia, should be noticed in the dissection of the parts. Besides these vessels, numerous inguinal glands will be seen lying beneath the fascia, and intermingled with its fibres.

Under the superficial fascia, lies the tendon of the *external oblique* muscle. The lower margin of this constitutes Poupart's ligament, which extends from the anterior superior spinous process of the ileum to the pubes ; and as it approaches that part, splits into two columns, the upper of which is inserted into the symphysis, the lower into the tuberosity of the bone ; leaving between them a triangular space, called the external abdominal ring, out of which emerges the spermatic cord.

When the tendon of the external oblique is cut away, or turned down upon the thigh, the *internal oblique* muscle is brought into view. The lower margin of this arises from the

outer half and inner surface of Poupart's ligament, and passing above the spermatic cord, in a vaulted form, is fixed by a tendon into the symphysis pubis. From the edge of the internal oblique, the *cremaster* muscle arises, is inserted into the spermatic cord, and descends with it into the scrotum.

The lower edge of the transversalis muscle, like that of the internal oblique, arises from the outer portion of Poupart's ligament, crosses over the spermatic cord, and uniting its tendon with that of the internal oblique, is inserted into the pubes.

These three muscles—the external oblique, the internal oblique, and the transversalis—serve to cover the abdomen, and support the viscera. From the manner, however, in which the last two are formed, (being deficient, as it were, in part, or not wholly inserted into Poupart's ligament,) this support would be very inadequate, were it not for the co-operation of an additional structure—the *fascia transversalis.*

This fascia consists of condensed cellular membrane, lines the internal surface of the transversalis muscle, and is interposed between it and the peritoneum. Its extent is very considerable, for it not only covers the whole of the lower part of the abdomen and passes out along with the femoral vessels upon the thigh, but ascends to the diaphragm. In this fascia, an opening is left for the passage of the spermatic cord—called the *internal abdominal ring*

The *spermatic cord*, consisting of arteries, veins, lymphatics, nerves, the vas deferens, and a membranous sheath, enters the internal abdominal ring—which is situated about half an inch above Poupart's ligament, and midway between the spine of the ileum and symphysis pubis—and taking a course inwards and downwards, passes under the edges of the internal oblique and transversalis, and finally emerging at the external ring, descends nearly in a perpendicular direction into the scrotum. Along the under and inner side of the spermatic cord, and between it and the pubes, passes the *epigastric* artery, a vessel materially concerned in the operation for strangulated inguinal hernia.

From the above account of the structure of the parts immediately concerned in inguinal hernia, it will appear—that there are two abdominal rings, the *external*, formed by a splitting of the fibres of the external oblique tendon, the *internal*, by an

opening in the fascia of the transversalis muscle. To make this structure more intelligible to the student it will be proper to observe that these rings are distant from each other, in most full-grown subjects, about an inch and a half, that between them there is a canal for the passage of the cord, that the cord enters the internal ring, passes obliquely downwards, under the internal oblique and transversalis muscles, (not through them, as formerly supposed,) until it reaches the external ring, after which its course is perpendicular. To understand the reason of the cord not perforating the internal oblique and transversalis, it will only be necessary to remember that these muscles are not attached to the whole of Poupart's ligament, but only to the outer half of it, and consequently that they may be said to be wanting from that part as far as the symphysis pubis.

In most instances, the hernial sac and its contents enter the internal abdominal ring anterior to the spermatic cord, and having reached the origin of the cremaster muscle, pass between it and the cord. Sometimes, however, the cord is placed on the side of the sac, at other times on its front. The epigastric artery runs along the under and inner side of the sac, and between its mouth and the symphysis pubis. In immediate contact with the sac, and on its anterior surface, is spread out, from pressure, the cremaster muscle, which forms one of the coverings of the sac. Above the cremaster is the superficial fascia, and next to it the integuments. If a dissection, therefore, is made of the coverings and contents of the inguinal hernia, commencing at the skin, the parts will be presented in the following succession—the integuments, superficial fascia, the cremaster muscle, the hernial sac, omentum or intestine, and perhaps both.

The *symptoms* of reducible, irreducible, and strangulated inguinal hernia do not differ from those of hernia in general, and these have been already pointed out in the preceding section. But it is important to distinguish between this disease and others bearing to it some similitude. Inguinal, or rather scrotal hernia, may be confounded with hydrocele, cirsocele, enlarged testis, and some other affections. From hydrocele, it may be distinguished by the circumstance of the tumour commencing above the abdominal ring, and descending towards the scrotum,

whereas hydrocele always begins in the lower part of the
scrotum, and gradually ascends. Cirsocele sometimes bears a
striking resemblance to scrotal hernia, but it may be distin-
guished from it by placing the patient in a recumbent position,
pressing firmly upon the upper part of the ring, and then direct-
ing him to rise, when, if it be cirsocele, the tumour will reappear,
and of an increased size; if hernia, it will be retained within
the ring until the finger be removed.

An inguinal hernia, is sometimes contained within the canal
leading from the internal to the external ring. It is then called
concealed inguinal hernia. As in cases of this description there
is commonly no external tumour, the surgeon should be on his
guard, and suspect the existence of this disease, if the symptoms
of strangulation be present. The hernial sac in such cases is
generally covered, in addition to the usual investments, by the
tendon of the external oblique, and edges of the internal oblique
and transversalis. Scrotal hernia in shape is commonly pyri-
form, and in size is very various, descending in some instances
to the patient's knees, at other times is not much larger than a
natural scrotum. Occasionally, the disease is met with on both
sides. Males are more subject to inguinal hernia than females,
and when it occurs in the latter the tumour bears the same
relation to the round ligament that it does to the spermatic cord
in the male.

TREATMENT OF INGUINAL HERNIA.

For reducible inguinal, or scrotal hernia, an appropriate
elastic truss should be selected. Above most instruments of
this description, I prefer that of Wright of Liverpool, formed
upon the principle of Whitford's truss, described in the work of
Mr. Lawrence on hernia. The peculiarity of these instruments
consists in their not forming a perfect oval, but in being straight
or nearly so behind, where they cross the small of the back, and
rising from the posterior part of the pelvis, and descending in
front towards the groin. Of the truss of Salmon and Ody,
—commonly called Hull's truss,—I have also a favourable
opinion. This, instead of passing entirely around the pelvis, is
formed of a semicircle of steel, with a pad at each extremity—

one of which is adapted to the groin, the other to the back. In fitting a patient with a truss for inguinal hernia, the surgeon should take care to adapt the instrument to the lower part of the internal ring; for if it be placed, as is too often done, upon the external ring, it not only presses upon the cord, gives unnecessary pain, and injures the function of the testicle, but does not answer the purpose of supporting the hernia. Every patient should habituate himself to return his own hernia and to apply the truss; and the most convenient time for effecting this is in the morning before he rises, as the intestines and omentum, during the night, generally retire within the abdomen. For radical cure, Chase's truss will be found the best instrument.

The *irreducible* scrotal rupture subjects the patient, when it attains a large size, to great inconvenience, by impeding copulation and arresting the flow of urine, which, from the penis being buried among the integuments, excoriates the parts and gives rise to small abscesses. To prevent the growth or increase of the swelling, *a bag truss* is the only remedy.

Strangulated inguinal or scrotal hernia, should the taxis and tobacco injection fail, will require an operation, and the sooner this is performed, after it has been determined upon, the better; for there is reason to believe that many lives have been lost by delay, and few, if any, from the operation itself. The patient being placed upon a table of ordinary height with his thighs somewhat separated, and each foot resting upon a chair, the surgeon sits before him, and grasping the tumour with one hand, makes an incision with the other, commencing at the upper part of the tumour, and extending downwards nearly to its base. Having divided the integuments, a branch of the external pudic artery generally springs, and may require the ligature. Immediately beneath the integuments, lies the superficial fascia; this should be divided by successive touches of the knife, until the cremaster muscle appears; the fibres of which may be elevated carefully by the dissecting forceps, or by running the directory beneath them, until the whole are cut through, and the sac exposed. To open this without risk of injuring the intestine, a portion of it may be pinched up and rubbed between the fingers previously to its division. As soon as the sac is opened, a quantity of fluid gushes out, and part of the intestine, or omentum, appears at the opening. Fluid, however, is not invariably met with,

and it is highly important that the operator should be aware of this, otherwise he might, in expectation of finding it, continue to penetrate with the knife, until he wounds the intestine. The opening in the sac should be enlarged upwards and downwards to the extent of two or three inches, and if its contents are found in a proper condition to be returned into the abdomen, the next step of the operation is to carry the forefinger of the left hand upwards between the sac and protruded parts, and search for the stricture, which will be found either at the edges of the external ring, the internal ring, or the mouth of the sac. In very old and large herniæ, the external ring is the most common seat of the constriction, but, in ordinary cases, the internal ring. By gentle pressure with the fingers upon the intestine or omentum, these parts may sometimes be restored without dividing the stricture; if the attempt fail, however, the operator then introduces a common curved probe-pointed bistoury, (the edge of which, with the exception of half an inch of its extremity, is covered by a piece of riband or muslin,) with its flat surface between the sac and its contents, and with the fore-finger as the guide, carries its point beneath the stricture, turns up the edge of the instrument and divides it. A very slight incision, even the eighth or sixteenth part of an inch in extent, will be often sufficient to liberate the parts. The moment this is accomplished, repeated and gentle efforts should be made to return them to the abdomen, after which the edges of the wound must be brought together and retained by adhesive straps. In the course of three or four hours after the operation, should the patient not have a stool within that time, a dose of caster oil must be administered. During the cure the patient should be confined to bed, and not suffered to rise until the parts are so completely cicatrized, as to bear the pressure of a truss—an instrument still more necessary after an operation for strangulated hernia, than before.

In dividing the stricture, in all cases of strangulated inguinal hernia, whether seated at the external or internal ring, or at the mouth of the sac, there is one rule extremely important to observe—to carry the knife directly upwards, (a practice first suggested by Rougemont, and afterwards adopted by Sir Astley Cooper,) by which we avoid wounding the epigastric artery. If, in the ordinary situation, for example, of this variety of

hernia, the stricture be divided upwards and inwards, or
towards the linea alba, and the incision prolonged to any
extent, the epigastric will, almost to a certainty, be cut across.
On the other hand, if the knife be carried upwards and out-
wards towards the ilium, and the hernial sac should descend,
as it sometimes does, on the inner side of the epigastric, (con-
stituting the variety of hernia called *ventro-inguinal*,) this vessel
may possibly be divided. It is proper to observe, however,
notwithstanding these precautions, that there are few examples
of fatal hemorrhage from wounds of the epigastric, although the
vessel has been cut in numerous instances by awkward and
careless operators.

With regard to the condition of the intestine or omentum, it
may be observed—that if mortified spots appear on the former,
they should be included in a fine ligature before returning them
to the belly; and that if the omentum be in an indurated state,
and form too large a protuberance to admit of repassing the
ring, it should be retrenched, taking care to tie up any particular
vessels that may spring, instead of including the whole mass in
a ligature, as was formerly practised. Dr. Parsons, an eminent
surgeon of Providence, Rhode Island, informs me that he once
removed six ounces of omentum without injury to the patient.

Sir Astley Cooper, and some other surgeons have recom-
mended, in large herniæ especially, to divide the stricture on the
outside of the sac—leaving the sac unopened. To this plan,
however, there are many objections, founded chiefly upon the
difficulty of the operation, and the impossibility of knowing the
condition of the intestine or omentum unless they are exposed
to view.

The operation for small, or *concealed* inguinal hernia, does
not differ materially from that of the common variety of the
disease.

If the operation for strangulated inguinal hernia has been so
long delayed as to permit the parts to fall into gangrene, and
they are found in this condition by the surgeon after having
opened the sac, he sho ld not think of pushing them, in this
state, into the abdomen, even if he could effect it, because they
would then act as extraneous bodies, and excite irritation. By
the time, however, the process of sloughing is completed in the
parts exterior to the stricture, it generally happens that the parts

within the abdomen or its immediate vicinity are united by adhesion to the internal surface of the ring, and, therefore, that the protrusion could not be returned without previously breaking up those adhesions, upon which, indeed, the safety of the patient must now in a great measure depend.

Some surgeons have attempted to cure inguinal and other varieties of hernia *radically*—by relieving the stricture, returning the protruded parts, and afterwards dissecting up the hernial sac, and either restoring it to the abdomen, or removing it entirely, and tying its mouth with a ligature. The practice, I conceive, is seldom justifiable. Many years ago I performed the operation, but the case terminated fatally. Experience proves, moreover, that a new sac, even if the patient recover, is almost sure to form.

SECTION V.

FEMORAL HERNIA.

THE contents of a femoral or crural hernia, instead of passing through the abdominal rings, are protruded beneath Poupart's ligament, through an opening termed the *crural* ring. This ring is bounded on the outer or iliac side, by the femoral vein, on the inner or pubic side, by Gimbernat's ligament, anteriorly, by Poupart's ligament, and posteriorly by the pubes. Poupart's ligament arises from the spine of the ilium, and is implanted by a broad insertion into the symphysis pubis, into the tuberosity of the pubes and into the ligament of the pubes over the linea-ileo pectinea. By this last insertion a sharp cresentic edge is formed, the concavity of which looks towards the crural vein, and is supposed by most writers, to contribute mainly to the constriction in cases of strangulated crural hernia. From having been particularly described by Gimbernat, a Spanish surgeon, it is frequently called *Gimbernat's* ligament. There are two margins to Poupart's ligament, an anterior and posterior, the former of which is straight, the latter concave, in the vicinity of the pubes.

The *fascia lata* of the thigh, as it approaches Poupart's ligament, divides into two portions—the *iliac*—sometimes called *sartorial*—and *pectineal*. The former is connected to Poupart's ligament throughout the greater part of its extent ; the latter is attached to the pubes, covers the muscles that spring from that bone, and unites with the iliac portion below, at the spot where the vena saphena major enters the femoral vein.

In thickness and strength the iliac portion of the facia lata greatly exceeds the pectineal portion. It lies, moreover, considerably above the plane of the latter, and covers the femoral vessels, the anterior crural nerve, and the iliacus internus and psoæ muscles. Towards the pubes its edge is concave, and on this account was denominated by Burns, of Glasgow, the

falciform process. Its superior horn received from Mr. Hey
the appellation of *femoral* ligament, and is at the present day
commonly known under the name of *Hey's* ligament. " It has
already been stated," says Colles, " that the iliac portion of the
fascia lata passes before the femoral vessels. We observe, in
this part of its course, that it loses somewhat of its strength
and firmness of texture; however, it generally retains a good
deal of its ligamentous nature even when it has reached the
pubic side of these vessels; except in the immediate neighbour-
hood of the vena saphena, where it differs but little from the
cellular substance. Having passed before the femoral vessels,
we find it now to descend on their pubic side; and here
we see it attach itself very intimately to the pectineal fascia.
This attachment is made in a straight line along the pubic
side of the vein, from the place of insertion of the saphena
to within a quarter of an inch of Poupart's ligament. At this
place we observe that the line of attachment is curved; and
having here formed a sweep towards the pubes, that the attach-
ment now takes place in a line across the top of the thigh."* In
most subjects, I have found the iliac portion of the fascia lata to
consist of two layers, the innermost of which passes backwards
behind the femoral vessels, and is united with the pectineal por-
tion—leaving the falciform process double, like the margin of the
cuff of a coat, and forming a round instead of a sharp edge.†

Beneath the fascia lata, and in immediate contact with the
femoral vessels, lies the *fascia transversalis.* This fascia, as
formerly mentioned under the head of Inguinal Hernia, not only
lines the internal surface of the abdomen, but passes out upon
the thigh under the posterior edge of Poupart's ligament.
Descending in front of the crural artery and vein, it becomes
united to their sheath and forms for them an additional invest-
ment. On the inner side of the crural vessels numerous ab-
sorbents may be observed passing through the transversalis
fascia, on their way to the abdomen.

The *fascia iliaca* is but a continuation of the fascia transver-
salis, and differs from it only in situation. It lines the surface
of the iliacus internus and psoæ muscles, adheres to the pos-

* Surgical Anatomy, p. 68.
† My observations have been lately confirmed by modern European authority of
great respectability.

terior margin of Poupart's ligament, descends with the crural vessels to the thigh, and affords them posteriorly a strong investment. The union of the fascia transversalis and iliaca has been compared,* not unaptly, to a compressed funnel, the expanded part of which may be said to occupy the lower part of the abdomen and hollow of the ilium, while the pipe is represented by the prolongation which covers the femoral vessels and forms their anterior and posterior sheaths.

Although the space between the os innominatum and Poupart's ligament is filled up by the iliacus internus and psoæ muscles, these would not prove a sufficient barrier to the descent of a femoral hernia in various situations between the spine of the ilium and symphysis pubis. Such descent, however, is effectually guarded against, except at the crural ring itself, by the union of the fascia transversalis and iliaca. These fasciæ, indeed, are so closely connected with each other, with the posterior edge of Poupart's ligament, and with the surface of the psoas and iliacus internus muscle, and send off so many partitions between the crural artery and vein, and the adjoining parts, as to preclude effectually the escape of any of the viscera between them.

In dissecting the parts concerned in crural hernia, it is important to notice particularly the situation of the spermatic cord and epigastric artery. The former lies about half an inch from the mouth of the sac, above Poupart's ligament; the latter runs upon the outside of the hernial sac, and takes a course upwards and inwards on its way to the rectus muscle. Sometimes the *obturator* artery is sent off by the epigastric, and, running along the inner margin of the sac, and sometimes encircling it, is liable to be wounded, in performing the operation for strangulated femoral hernia, if the incision be prolonged too far inwards or towards the pubes.

A portion of omentum, or intestine, surrounded by the peritoneum, having entered the sheath of the femoral vessels, formed by the union of the iliac and transversalis fasciæ, passes along the inner edge of the crural vein, and carries before it the loose cellular membrane that naturally occupies the orifice of the crural ring. This membrane, (which has received from Sir Astley Cooper the name of *fascia propria*,) being pushed for-

* Colles, p. 63.

ward by the hernial sac, is carried along with it through one or
more of the holes on the inner side of the crural sheath, and
uniting with that sheath, the two fasciæ are " consolidated into
one." Above the fascia propria will be found the superficial
fascia and the integuments. If a dissection, therefore, be made
of a femoral hernia, commencing at the surface of the bend of
the thigh, the parts will be presented in the following order :—
the integuments, superficial fascia, fascia propria, hernial sac.
This last will be found resting in the hollow between the iliac
and pectineal portions of the fascia lata, and, consequently, on
the *outer* surface of that aponeurotic expansion. There is a
variety, however, of femoral hernia, (in which the sac and its
contents, not passing through the absorbent holes, is continued
along the sheath of the femoral vessels,) *covered* by the fascia
lata.

Women are more subject to femoral hernia than men, owing
partly to the great breadth of the female pelvis, compared with
that of the male. In shape, femoral hernia differs entirely from
inguinal—its longest diameter being placed transversely with
respect to the thigh. In general, moreover, the tumour is much
smaller than that of the inguinal. On this account it is par-
ticularly liable to be confounded with other diseases, especially
with enlargement of one or more glands of the groin, with
varicose enlargement of the crural vein, psoas, abscess, &c. In
one patient, however, an old man in the Philadelphia Hospital,
in 1833, I found the tumour as large as a child's head. Not
unfrequently it is mistaken for inguinal hernia—owing to the tu-
mour rising, from the oval space in the fascia lata, upon Poupart's
ligament. The edge of this ligament may, however, in femoral
hernia, always be traced above the tumour, while in bubonocele
it is below it. A very common symptom of reducible femoral
hernia, is pain in the groin, extending from the thigh, which is
sometimes so severe as to produce nausea and vomiting.

TREATMENT OF FEMORAL HERNIA.

The truss for *reducible* inguinal hernia, will answer also for
femoral, provided the pad of the instrument be bent downwards
about an inch, in order that it may rest on the top of the thigh

instead of the groin. *Irreducible* femoral hernia, when its contents consist chiefly of omentum, sometimes attains such a bulk as to prove very inconvenient to the patient. Under these circumstances, it has been advised by Sir Astley Cooper to apply a hollow truss to the tumour, (taking care previously to reduce the intestine,) with a view of promoting, by pressure, the absorption of the protruded parts.

Strangulated femoral hernia must be treated upon the principles formerly laid down. Instead, however, (in performing the operation of taxis,) of pressing the tumour directly upwards, as in strangulated inguinal hernia, the surgeon should first endeavour to disengage it from the edge of Poupart's ligament, by pressing it downwards and inwards; after which a slight pressure upwards will often succeed in restoring the omentum or intestine to the abdomen. If the taxis should fail, and an operation become necessary, there should be the least possible delay; for the disease runs its course with much greater rapidity than most other varieties of strangulated hernia.

The patient being placed horizontally on a table, the shoulders elevated by a pillow, the thighs somewhat relaxed and brought near to each other, the diseased parts shaved, and the bladder emptied, an incision is made, commencing about an inch above Poupart's ligament, and extending downwards to the middle of the tumour, through the integuments. At right angles with this, another cut is made—the two representing in form the letter T reversed. The superficial fascia being exposed and carefully divided, the fascia propria is brought into view. This being likewise divided, more or less adipose substance will be generally found between it and the sac. To open the sac, which should next be done, without risk of injuring the intestine, (for in this variety of hernia there is seldom much fluid in the sac,) a portion of it should be carefully pinched up and rubbed between the finger, and divided by carrying the knife horizontally through it. As soon as the intestine, or omentum, is discovered, a finger may be introduced into the opening, and upon this a curved bistoury, with which the sac may be enlarged, to the extent, if necessary, of several inches. The next object of the operator will be to ascertain the seat of the stricture. This will be found either at Hey's ligament, in the crural sheath, at Gimbernat's ligament, or in the mouth of the sac. When the

hernial tumour is large, more or less constriction will always be made upon it by the falciform process of the fascia lata, and particularly by that portion of it called Hey's ligament. In ordinary cases, however, I am inclined to believe that the sharp posterior border of Poupart's ligament, or the ligament of Gimbernat, as it is called, contributes more than any other part to keep up the symptoms of strangulation. But be this as it may, the surgeon must proceed in his operation until he has removed every obstacle. With this view, passing the fore-finger of his left hand gently between the sac and its contents, he carries it upwards until he meets resistance. The bistoury should then be passed, with its flat edge towards the finger, until it is fairly within the strictured part, when its edge may be turned up and pressed lightly against the obstruction. If the parts are not sufficiently liberated to be returned by moderate pressure, the finger should be carried higher, and other obstructions sought for. These, if found, must likewise be divided, taking care in making each incision to carry the bistoury upwards and slightly inwards. The operator, if regardless of this rule, might, by prolonging his incision outwards, or upwards and outwards, injure the crural vein and epigastric artery. On the contrary, by directing the knife too far inwards or towards the pubes, the obturator artery, in case it should happen to spring from the epigastric and take an inward course, would be endangered. By the inward incision, moreover, there is great risk of wounding the intestines. Having relieved the stricture and restored the contents of the sac to the abdomen, the after treatment will not differ from that pointed out in some of the preceding sections.

SECTION VI.

UMBILICAL HERNIA.

THE umbilical vein, and its two arteries, in the fœtus, perforate the tendons of the abdominal muscles about the centre of the linea alba, and leave an opening called the *umbilical* ring. Soon after birth these parts are consolidated, and a firm cicatrix is formed, externally, by the contraction of the integuments, internally by the peritoneum, and between the two, by the remains of the umbilical vessels. The ring being thus closed and fortified, protrusions of the abdominal viscera, in most subjects, are guarded against. Sometimes, however, it happens, that the ring is imperfectly closed, or its edges so weak, as readily to yield to any force the viscera may exert against it. Under these circumstances, an umbilical hernia will be produced. It is still a disputed point whether the protrusion takes place at the centre of the umbilical ring, or at its edges. Sir Astley Cooper inclines to the former opinion. There is reason to believe, however, that both occurrences are not unfrequent. Many of the older writers believed the umbilical hernia to be destitute of a sac or peritoneal covering, erroneously supposing that the umbilical vessels were naturally situated behind that membrane, and, consequently, that the abdominal contents were protruded through the imaginary opening, in the peritoneum, for the transmission of these vessels. The fact, however, that the arteries and vein, while on their way to the umbilical cord, lie between the abdominal tendons and peritoneum, has long been known. The inference, therefore, is not less plain than true,— that the umbilical, like most other varieties of hernia, is covered by a peritoneal sac.

There is some variety in umbilical hernia, according as it occurs in the infant at birth, in the young subject, or the adult.

The *congenital* umbilical hernia, as it is called, is often complicated with spina bifida, and with extraordinary enlargement of the liver and other abdominal viscera. The contents of the abdomen are protruded through the umbilical ring into a transparent bag, formed out of the cellular membrane that connects the vessels of the cord. So transparent, indeed, is this investment, that throughout the greater part of the tumour, the hernial sac may be distinctly seen.

The umbilical hernia of *young subjects* is, unlike the congenital variety, covered by the common integuments of the abdomen, and generally makes its appearance about the third or fourth month after birth. It seldom attains, unless very much neglected, a large size; indeed, in many instances, the tumour scarcely exceeds a common marble in bulk, and when pressed upon, readily retires into the abdomen; returning again, however, as soon as the pressure is discontinued. Its figure is commonly round. A fold of intestine generally occupies the hernial sac, and omentum is scarcely ever met with. The disease is often accompanied by disorder of the bowels and digestive organs.

Amongst *adults*, the most common causes of umbilical hernia are, pregnancy, laborious parturition, and inordinate fatness. Hence, women, and especially those who have borne many children, are most subject to the disease. The tumour may, perhaps, remain stationary, or nearly so, for years; in the end, however, it is almost sure to attain considerable bulk, and sometimes exceeds in magnitude the patient's head. Nausea, eructations, constipation of the bowels, are very common attendants upon this variety of hernia. In general, the omentum constitutes a very large proportion of the contents of an old umbilical hernia, and the colon is oftener found in the sac than any other intestine.

TREATMENT OF UMBILICAL HERNIA.

Congenital umbilical hernia, provided there be no extraordinary deficiency of the tendinous parietes, or other morbid complication may be cured, frequently, by a well contrived bandage, or by surrounding the sac and integuments, (having

previously reduced the intestine,) with a ligature—drawn with sufficient firmness to occasion the parts included in its embrace to slough, and the edges of the umbilical ring to cicatrize. The last is the most certain and expeditious mode of effecting a cure. Instead of the simple ligature, Dr. Hamilton, of Edinburgh, approximates the edges of the ring by silver pins and adhesive straps. His example, however, should not, I conceive, be imitated.

The ligature was frequently employed by the ancients, in the cure of umbilical hernia of *young subjects*, and, in modern times, has been extensively used and highly extolled by Desault. In several instances I have performed the operation with complete success, and with little pain or inconvenience to the patient. There is no risk in the operation, provided the surgeon succeeds perfectly in restoring the protruded parts to the abdomen, before he ventures to apply the ligature; which should be of considerable thickness and strength, and drawn so firmly as to insure the speedy destruction of the part surrounded by it. After the slough is detached, the sore that remains may be dressed with dry lint or some mild ointment until perfectly healed. For two or three months afterwards it will be proper to support the new-formed cicatrix by a compress or truss, to guard against its laceration and the consequent reproduction of the disease. The disease sometimes disappears of its own accord.

To the reducible umbilical hernia of *adults* the ligature is not adapted. In such cases the surgeon must depend upon a *truss*, which, so long as it keeps the intestine or omentum within the abdomen, will at least prevent the increase of the tumour, and may, eventually, perhaps, by exciting a slow inflammation, effect a cure. Sir Astley Cooper, in small herniæ, prefers the common inguinal truss, which, if it form a perfect oval, will without difficulty adapt itself to the body, and furnish the requisite support to the tumour. For large umbilical herniæ, however, the trusses invented by Morrison, or Eagland, of Leeds, and described in most modern systems of surgery, will be found to answer a better purpose than any others. When the hernia is irreducible, and of very large dimensions, a hollow truss, or a wide belt, carried under the tumour and over the patient's shoulders, may be resorted to advantageously.

Strangulated umbilical hernia very frequently proves fatal, as much from disorder of the intestinal functions, as from the strangulation.   When the usual remedies fail, an operation should be resorted to.   This may be done in the following way. An incision, several inches long, is made very cautiously, through the integuments and superficial fascia, when the sac, if not absorbed, as it often is, will appear.   Into this a small opening should be made, from which fluid in considerable quantity generally issues.   The opening may then be enlarged, and a finger carried upwards between the omentum and intestine as high as the umbilical ring.   Upon the finger a bistoury is next carried through the linea alba, to the extent of an inch, which, in most cases, will relieve the stricture sufficiently to enable the operator without much difficulty to restore the parts to their former situation.

To guard against peritoneal inflammation, which is sometimes apt to follow the operation just described, Sir Astley Cooper, in two instances, adopted the following mode of procedure.   " As the opening," says he, " into the abdomen is placed towards the upper part of the tumour, I began the incision a little below it, that is, at the middle of the swelling, and extended it to its lowest part.   I then made a second incision at the upper part of the first, and at right angles with it, so that the double incision was in the form of the letter T, the top of which crossed the middle of the tumour.   The integuments being thus divided, the angles of the incision were turned down, which exposed a considerable portion of the hernial sac.   This being then carefully opened, the finger was passed below the intestine to the orifice of the sac at the umbilicus, and the probe-pointed bistoury being introduced upon it, I directed it into the opening at the navel, and divided the linea alba *downwards* to the requisite degree, instead of *upwards.*"

Dr. Physick has proposed, in strangulated umbilical hernia, to make a crucial incision through the integuments, as far as the neck of the sac, then open the sac at its upper part to an extent sufficient to enable the operator to examine its contents, and reduce them, if possible, without dilating the umbilical ring. Should the latter expedient, however, become necessary, the stricture must be divided on the outside of the sac.   After the omentum and intestine are restored to the abdomen, a ligature

should be drawn round the neck of the sac, with a view of closing the cavity and obviating peritoneal inflammation. The late Dr. Wistar once performed the operation with success. In the case of a Mrs. N., a very respectable Jewish lady, I performed a similar operation about sixteen years ago. The tumour, however, was as large as a child's head, and had been strangulated several days before I saw the patient, and, on this account, the operation did not succeed. The patient, too, was advanced in years, extremely corpulent, and had long suffered from derangement of the functions of the stomach and intestines. Under these circumstances, no operation, probably, would have answered the purpose, even if performed in the very commencement of strangulation.

SECTION VII.

CONGENITAL HERNIA.

This, as its name implies, is met with at birth, or, as gene-
rally happens, a short time after birth.   It differs from common
inguinal hernia, in being destitute of a distinct peritoneal sac,
and in being lodged in the tunica vaginalis, in contact with
the testicle.   " In a common rupture," says Professor Cooper,
" the viscera push out with them a portion of the great bag of
the peritoneum, which thus forming one of the most regular in-
vestments of the displaced bowels, is called the hernial sac.
But in the congenital inguinal hernia, the sac, in which the
viscera lie, is not thrust forth in this manner, by the displaced
bowels; on the contrary, it is a production of peritoneum origi-
nally formed and placed ready for the reception of the testes
on their descent from the loins, but into which the bowels are
sometimes accidentally propelled, before the passage leading
into it from the belly is duly closed.   The congenital inguinal
hernia, therefore, differs from the generality of ruptures, in
having no hernial sac, formed and produced by the peritoneum
being thrust forth from the belly by the displaced bowels them-
selves.   There is, indeed, one very uncommon species of scrotal
hernia, contained in the tunica vaginalis, yet included, also, in a
common hernial sac, so that the protruded bowels neither lie in
contact with the preceding membrane, nor with the albuginea.
This particular case was first noticed and described by the late
Mr. Hey.   It seems to be formed after the communication of
the cavity of the peritoneum with that of the tunica vaginalis
has been obliterated, but previously to the closure of the passage
lower down."*   In most respects, the anatomy of congenital
hernia resembles that of the inguinal.   The spermatic cord, and
the spermatic artery lie behind the hernia.   The testicle, from

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* First Lines of the Practice of Surgery, vol. ii. p. 23, 4th edit.

being surrounded by the intestine or omentum, can seldom be distinctly felt.

Congenital hernia sometimes resembles hydrocele so closely as to be mistaken for that disease—owing to water accumulating in the abdomen and passing along with the hernia into the tunica vaginalis. It is very important to distinguish the one disease from the other ; which may generally be done by placing the patient in the horizontal position, returning the hernial contents to the abdomen, and there retaining them by a finger pressed upon the abdominal ring. In the mean time, the water alone remaining in the tunica vaginalis may be easily distinguished by its transparency and peculiar feel.

TREATMENT OF CONGENITAL HERNIA.

The reducible congenital hernia, if attended to soon after the disease is discovered, may be readily cured by a well constructed truss—inasmuch as there is a strong disposition in the tunica vaginalis at the ring to close of itself after the descent of the testicle. A spring truss can seldom be used in a child immediately after birth, but a linen compress, covered by a bandage, if well applied, will generally answer every purpose ; and after the lapse of a few months a truss with a weak spring may be employed. It sometimes happens that the testicle is detained at the ring, and that the omentum or intestine is placed above or along side of it. In such a case a truss should not be applied, as it will either prevent the descent of the testicle, or bruise the hernial contents.

Strangulated congenital hernia, if not relieved by the usual remedies, will require an operation, which differs from that of common inguinal hernia, chiefly in this particular—that the incision of the sac should never be prolonged further than the upper part of the testicle, in order to obviate inflammation of the tunica vaginalis, to which this membrane is particularly prone.

That inflammation is propagated, more readily, to the peritoneum within the abdomen, after the operation for strangulated *congenital* hernia than for that of castration, is owing to the tunica vaginalis, in the former case, being continuous with the

peritoneum, whereas in the latter it is closed immediately after
the descent of the testicle.   In certain quadrupeds—as in the
horse—the tunica vaginalis communicates directly with the
abdomen and is continuous with the peritoneum.   If, therefore,
in castrating such animals, care be not taken to *sear* the cord
and edges of the tunica vaginalis, by hot irons, as practised,
with propriety, by farriers, death will be very apt to follow.
Many years ago, to oblige a friend, I performed the operation
on a colt, and tied up the vessels as I would have done in the
human subject.   Violent inflammation followed, and the animal
was saved with great difficulty.   Sir A. Cooper mentions a
similar instance.   Searing obliterates the passage between the
abdomen and tunica vaginalis, and produces the same effect as
natural adhesion in the human subject.

In large congenital herniæ that have long remained irreduci-
ble, Sir Astley Cooper advises the return of the parts without in-
spection, provided the stricture can be removed without opening
the tunica vaginalis.

SECTION VIII.

VARIETIES OF HERNIA.

THERE are several varieties of hernia that differ from those already described, chiefly in situation, but which, from certain peculiarities growing out of that and a few other circumstances, require some notice. These are ventral, pudendal, vaginal, thyroideal, perineal, ischiatic, cystic, mesocolic, phrenic, and mesenteric hernia. Of each of these I shall endeavour to give a short account.

Ventral hernia, or that variety of the disease which may take place at almost any part of the abdominal parietes, is seldom met with in the human subject, but is rather common among quadrupeds—being produced in them by blows, wounds, laceration of muscles, tendons, &c. It is generally met with at the linea alba, at some point between the scrobiculis cordis and pubes, and is sometimes so near the umbilicus as to be with difficulty distinguished from exomphalos. At other times it occupies the linea semilunaris. It occurs most frequently above the navel, and when very high up the stomach may form part of the contents of the sac. Cases of the kind are reported by Sir Astley Cooper. Cloquet mentions an instance of ventral hernia, which occupied the whole of the linea alba. Besides being covered by the superficial fascia, ventral hernia has an additional investment.

Pudendal hernia passes downwards between the ramus of the ischium and the vagina, displaces in its course some of the fibres of the levator ani, and forms an oblong tumour in the labium, which extends as far as the os uteri. It is sometimes confounded with thyroideal hernia.

In *vaginal* hernia the viscera descend between the uterus and urinary bladder, or between the rectum and uterus. The tumour may be felt within the os externum, is elastic, free from pain, and may be pushed nearly upwards, but descends the moment

the support is taken away; hence most patients troubled with this disease are unable to take much exercise and suffer with bearing-down pains.

Thyroideal hernia, or hernia of the foramen ovale, was formerly considered very rare. Recently, however, several cases of the kind have been reported. It descends along with the obturator vessels and nerve, through an opening in the upper part of the obturator ligament, is covered, partially, by peritoneum, and met with more frequently in women than men. The tumour seldom attains a large size, and on this account, as well as its deep situation under the fascia lata, adductor and pectineus muscles, is not easily detected, and is, therefore, when strangulated, frequently confounded with ileus. Cloquet has furnished the best account of the disease.

Perineal hernia is that variety of the disease in which the sac and its contents descend between the vagina and rectum in women, and between the rectum and bladder in men. To discover it in the former, examination by the rectum and vagina will be necessary, and in the latter by the rectum, conjoined with pressure on the perineum. Bromfield relates a case of this disease which arose from a wound of the peritoneum in lithotomy.

Ischiatic hernia is rarely met with. It is sometimes congenital, and males are said to be more liable to it than females. In a case reported by Sir Astley Cooper, the sac was found under the glutæus maximus, its orifice before the internal iliac artery, below the obturator, but above the vein, and the ileum lodged in the pelvis on the right side of the rectum. The disease is liable to be mistaken for abscess, gluteal aneurism, and encysted tumour. Haller relates a case, where the tumour attained such dimensions as to require to be supported on the patient's shoulder.

Hernia of the *urinary bladder*, or cystocele, is by no means so uncommon as supposed. It has, at first, no proper peritoneal investment; but the bladder, from extraordinary lateral distension or relaxation, passes into the inguinal or crural rings, or other natural or preternatural openings, and, at last, when the fundus descends, the portion of peritoneum belonging to it is also carried down, and forms a sac, in which intestine and omentum are afterwards lodged. " Cystocele," says Mr. Crosse, " dis-

poses strongly to the formation of an urinary calculus, and in all the various situations in which this species of hernia has been found, as inguinal, femoral, ventral, ischiatic, pudendal, and perineal, a stone may be met with."* Many extraordinary cases of the kind have been reported, some, in which the bladder has been opened by mistake, or cut off, and others, in which the patients have suffered from the stone being compressed by a truss. Pregnant women are most subject to the disease. Strangulation seldom occurs. The tumour, however, varies in size, according as the bladder is full or empty. When distended by urine, the patient experiences a good deal of irritation, and is obliged to evacuate the urine, to facilitate which he gets into the habit of pressing the tumour.

Mesocolic hernia is that variety in which the intestines pass between the layers of the mesocolon. In like manner, when omentum or portions of intestine force their way through one layer of the mesentery, while the other remains entire, a *mesenteric* hernia will be produced. From many other similar causes, hernial protrusions arise, but the nature of the disease is seldom ascertained during life, and is generally confounded with ileus and other affections.

Phrenic hernia is sometimes congenital, and sometimes the result of wounds, lacerations, or distension of the natural apertures of the diaphragm. In either case, the viscera of the abdomen, by being transferred to the chest, press upon and interfere with the heart and lungs, and give rise to asthma, palpitation and other violent symptoms. If strangulation should follow, other symptoms will be superadded, and the patient cannot long survive. Children not unfrequently die an hour or two after birth from congenital malformation of the diaphragm, and transposition of the abdominal viscera to the thorax. A remarkable case of the kind is recorded by Sir Astley Cooper, as having occurred to a Dr. Macauley. " The child was a full grown boy, remarkably fat and fleshy, and, when first born, started and shuddered, so that the nurse apprehended his going into fits; he breathed, also, with difficulty, and it was some time before he could cry, and when he did, there was something particular in the note. He seemed to revive a little in half an hour,

* Crosse on Urinary Calculus, p. 5, 4to., Lond. 1835.

and breathe more freely, but soon relapsed, and died before he
was an hour and a half old. Upon dissection, when the sternum
was raised, the stomach and greatest part of the intestines, with
the spleen and part of the pancreas, were found in the left cavity
of the thorax, having been protruded, through a discontinuation
or rather an aperture of the diaphragm, about an inch from the
natural passage of the œsophagus."

TREATMENT OF VARIETIES OF HERNIA.

For reducible *ventral* hernia, a well constructed truss is the
proper remedy. When strangulated, the taxis and the ordinary
remedies will generally answer; but if an operation should be re-
quired, the stricture may be divided either upwards or down-
wards, and caution observed in reference to the situation of the
epigastric artery.

Pudendal hernia is with difficulty supported by a truss or
bandage; nor does the pessary, recommended by many sur-
geons, answer a very good purpose. In a woman, I once
attended with Dr. J. G. Nancrede, I took a mould of the parts in
plaster of Paris, and by forming a truss upon the exact model
of the cast, succeeded in sustaining the rupture much better than
with any other contrivance I ever resorted to. Should the parts
become strangulated, and an operation be rendered necessary,
an incision should be made in the labium, and the stricture
divided inwards towards the vagina. *Vaginal* hernia is seldom
strangulated, and may be generally reduced by taxis. It is more
difficult to sustain, however, by a truss than even the pudendal
variety.

In *thyroideal* hernia, a truss can be adapted to the parts without
a great deal of difficulty ; should strangulation occur, however,
the operation must prove both delicate and hazardous, as there
would be risk of wounding the obturator artery, as well as the
crural vessels. To avoid these, the division of the obturator
ligament and stricture should be made inwards, towards the
ramus of the pubes ; but there would, also, be some risk of
wounding the obturator artery, in pursuing this plan, if it
happened to come off from the epigastric.

Perineal hernia, in the female, is best supported by a pessary,

and in the male, by an elastic steel truss, with a pad " that goes between the thighs backwards and upwards to the loins, where it is attached to a steel belt encircling the body." When strangulated in the female, an incision should be made from the vagina, and in the male over the tumour in the perineum.

Ischiatic hernia is with difficulty kept up by the truss, and if strangulated, would require a complicated and dangerous o - ration. For phrenic, mesocolic and mesenteric hernia, unfortunately, there is no relief.

Cystic hernia may, in the commencement, be reduced, and prevented from protruding to any extent by a well contrived truss ; but when once it has become irreducible, will not admit of relief. If complicated with scrotal or other varieties of hernia, and the operation for strangulation should be required, great care must be taken not to open the *bladder* instead of the hernial sac—as has happened in several cases.

On Hernia, consult Pott's Works by Earle, vol. ii.; Hey's Practical Observations in Surgery, 3d edit. ; The Anatomy and Surgical Treatment of Inguinal and Congenital Hernia, by Astley Cooper, fol. Lond. 1804 ; Ditto the Anatomy and Surgical Treatment of Crural and Umbilical Hernia, part ii. 1807 ; Lawrence, on Ruptures, 3d edit.; Scarpa's Treatise on Hernia, translated from the Italian, by John Henry Wishart, Edinburgh, 1814 ; J. Cloquet, Recherches Anatomiques sur les Hernies, 1817 ; A Treatise on Surgical Anatomy, part the first, by Abraham Colles, Philadelphia, 1820 ; C. Bell's Surgical Observations ; Drawings of the Anatomy of the Groin, by William E. Darrah, fol. Philadelphia, 1830 ; Treatise on the Radical Cure of Hernia by Instruments, &c. by Heber Chase, M. D. Philadelphia, 1836 ; Final Report of the Committee of the Philad. Med. Soc. on the Construction of Instruments, &c. by Heber Chase, M. D. Philadelphia, 1837.

SECTION IX.

ARTIFICIAL ANUS.

WHEN the operation for strangulated hernia has been too long delayed, and the intestine has mortified, it sometimes happens that an artificial anus is formed. In such cases the inflammation, instead of extending throughout the peritoneum and producing the patient's death, is limited to the neighbourhood of the stricture, and, terminating in the adhesive stage, glues the sound portions of intestine to the hernial sac. This adhesion becomes firmer and firmer, in proportion as the sloughing process, going on in the protruded parts, advances, until the sloughs are thrown off and fæces are discharged externally. By this provision of nature, effusions into the cavity of the abdomen are, in nine cases out of ten, effectually guarded against. As in every case of hernia the intestine is doubled upon itself, it follows that the two portions must lie parallel, or nearly so, with each other, and that when an artificial anus is formed, an intermediate ridge or projection will be the result. To the free admission of the fæces from the upper to the lower part of the canal this ridge will prove, in general, a serious obstacle; in most cases, indeed, there is a total cessation of fæcal discharge by the rectum; so much so that the intestine is constantly empty, or, at most, contains only a glairy mucus. After a time, however, fæces in small quantity occasionally pass through the lower part of the canal, and are discharged from the rectum. This is owing, in part, to the contraction of the external orifice of the artificial anus, and at the same time, to an enlargement of the passage between it and the orifice of each gut. As soon, therefore, as the fæces leave the upper intestine, they fall into a "funnel-shaped" cavity, and meeting with some resistance from the contracted mouth of the opening in the integuments, are propelled by a circuitous route towards the orifice of the lower gut.

An artificial anus, whether induced by a wound of the abdomen, or by hernia, is a very grievous disease, not only subjecting the patient to great inconvenience, but endangering his life. Most patients, labouring under the infirmity, are troubled with colic and other derangement of the intestinal functions. Besides, they have no control, for want of a sphincter, over the fæcal discharge. A prolapsus from one or both openings of the intestine, is by no means uncommon, and is sometimes exquisitely sensible. Artificial anus, when situated high up, or among the small intestines, is apt to terminate fatally—from inanition.

TREATMENT OF ARTIFICIAL ANUS.

Nature will often make surprising efforts towards restoration, and is sometimes abundantly successful. Aware of this, the surgeon must not be officious, but patiently wait, so long as there is any prospect of a favourable termination. In the mean time, the patient should be supplied with a common truss, the pad of which must be broader than usual, and covered with a piece of bladder or oiled skin. This serves the purpose of restraining the fæces, and at the same time contributes, by blocking up the external opening, to direct them to the lower intestine. If it should be found, however, after the lapse of months, that there is no prospect of amendment, an operation may be attempted for the relief of the sufferer. The indication to be fulfilled by this is to overcome the ridge-like barrier situated between the two intestines, and which prevents the direct descent of the excrement from one to the other. Desault, with this view, introduced into each orifice of the gut, plugs of lint or linen, and by these means frequently succeeded. A more expeditious, effectual, and less troublesome operation, was proposed and executed by the late Dr. Physick, between the years 1808 and 1809. A crooked needle armed with a ligature, was passed for some distance within the orifice of one gut, and brought out at the other—traversing in its passage the coats of each. The ends of the ligature were then tied at the external opening, and formed a loose loop. This being suffered to remain for a week, caused the sides of the intestines to adhere to each

other. Through the consolidated ridge, thus formed, an incision was afterwards made, and a direct communication established between the upper and the lower intestine. An operation, similar to that of Dr. Physick, was afterwards performed by the late Baron Dupuytren, in Paris, and to him the merit of the proposal is generally awarded by European writers—without the slightest foundation.

Dr. Physick's claim to priority, as respects the operation for artificial anus above described, having, as just mentioned, been contested by European surgeons, the following statement on the subject from the able pen of Dr. Benjamin Horner Coates, of this city, must carry conviction to the mind of every unprejudiced person.

"John Exilius, a Swedish sailor, aged nineteen years, was admitted into the Pennsylvania Hospital on the morning of the 20th of October, 1808, affected with a congenital hernia. He stated that he had passed the last fourteen days without having had a stool, and that on the 29th, he had been affected with stercoraceous vomiting. These were renewed after his admission. After several other means had been employed to produce a reduction of the hernia, the operation was proceeded to at half-past three o'clock the same afternoon, by the late Professor Wistar, in the presence of Dr. Physick. The sac being opened, the intestines were found firmly adherent to the testicle, and partially so, but with equal firmness to the abdominal ring, so as to account for the impossibility of effecting a reduction by the taxis—they appeared to be a part of the ileum. A perforation existed in the side of one of them, of sufficient magnitude to permit the discharge of a considerable amount of fæces. There were, however, no marks of mortification found, and the opening appeared to be the effect of mere ulceration. After the removal of the stricture and the application of a dressing, a dose of laudanum was administered, and the patient was returned to bed. Much enlargement of the abdomen continued, accompanied with great general restlessness, and but a small quantity of the fæces was discharged from the wound, though various means were employed to procure their expulsion. On the 22d and 23d, stercoraceous vomiting returned, and it was not till the 23d, that much relief was obtained. This was the result of a copious discharge produced by the injection into the bowel of an infusion

of senna. On the 24th, Dr. Wistar divided a small portion of the tendon of the transversalis abdominis, as well as of the neck of the sac, from which ensued much greater facility for the escape of the fæces. On the 30th of October, the patient, by the regulations of the hospital, came under the care of Dr. Physick. On the 24th of December, the projecting portion of the intestine was cut off close to the ring. This was done under the expectation that the open orifices thus left in the intestine would gradually be retracted within the abdomen. On applying a ligature to a divided mesenteric artery, severe pain was produced in that cavity, which was relieved by rhubarb, laudanum, and aniseed. After waiting some time, and finding that retraction did not take place, as hoped for, another process was resorted to. A roll of waxed linen, such as is used in making bougies, and of the size of the fore-finger, was bent double and each end introduced into one of the orifices of the intestine. The dresser then pressed the angular part of this tent backwards, in such a manner as to approximate the adherent intestine to a straight position. So much pain, of a kind similar to colic, was produced by this pressure, that the plan was necessarily abandoned. The two ends of the intestine were found, by a careful examination, to adhere to each other for some distance, and the form, thus presented, has been compared in this case to that of a double-barrelled gun. The next method proposed by Dr. Physick, was to cut a lateral opening through the sides of the intestine where they were adherent. But not knowing the extent of the adhesion inwards, he thought it necessary to adopt some preliminary measure for insuring its existence to such a depth as might admit of the contemplated lateral opening without penetrating the cavity of the peritoneum. By introducing his finger into the intestine through one orifice, and his thumb through the other, he was enabled to satisfy himself that nothing intervened between them but the sides of the bowels. He was thus enabled, without risk, to pass a needle, armed with a ligature from one portion of the intestine into the other, through the sides which were in contact, about an inch within the orifices, which ligature was then secured with a slip-knot. This operation was performed on the 28th of January, 1809. The ligature was merely drawn sufficiently tight to insure the contact of those parts of the peritoneal tunic which were within

the noose. When drawn tighter, it produced so much pain in the upper part of the abdomen, of a kind resembling colic, that it became necessary immediately to loosen it. The ligature, in this situation, gradually made its way by ulceration through the parts which it embraced, and thus loosened itself. It was at several periods again drawn to its original tightness.

After about three weeks had elapsed, concluding that the required union between the two folds of peritoneum was sufficiently insured, Dr. Physick divided with a bistoury all the parts which now remained included within the noose of the ligature. No unfavourable symptoms occurred in consequence. On the 28th of February, the patient complained of an uneasy sensation in the lower part of the abdomen, and on the first of March he extracted with his own fingers some portions of hardened fæces from his rectum. On the 2d of March, two or three evacuations were produced in this manner. On the 3d, an enema, consisting of a solution of common salt, was directed to be given twice every day. The first of these occasioned a natural stool, about two hours after its administration. The same effect was produced on the 4th, 5th, and 6th, and the discharges from the orifices in the groin now became inconsiderable. Adhesive plasters, aided by compresses, were employed, not only to prevent the discharge of fæces from the artificial opening, but with the additional object of procuring the adhesion of the sides. This last effort was unsuccessful. On the 24th of June, an attempt was made to unite them by the twisted suture. Pins were left in for three days, and adhesion was, in fact, effected ; but owing to the induration of the adjacent parts, the wound again opened. On the 27th of July, a truss of the common construction, furnished with a very large pad, and surmounted by a large compress, was applied to the wound. By these means the discharge of fæces from the groin was completely prevented, and the patient had regular evacuations per anum, except when, from improper diet or cold, he became affected with diarrhœa. At such times a small portion of the more fluid matter escaped by the sides of the compress. Not satisfied with this state of things, Dr. Physick made several attempts to improve the patient's condition. On the of 2d August, a mould of the parts was taken in plaster of Paris, and being covered with buckskin, was employed as a pad for the truss. The expedient answered

extremely well, as long as the patient continued in the same posture in which the mould was made; but as soon as the form of the parts was altered by a change of position, fæces escaped from the orifice. A bandage was then applied to the body, furnished with a thick compress, and having that part of it which crossed the patient's back formed of elastic, extensible wire springs, such as are used in suspenders. This, also, however, proved ineffectual. The truss with a compress and a large pad, stuffed in the common way, was then re-applied, and found to answer completely the purpose of preventing the discharge of fæces, the hope of an entire closure of the orifice being abandoned. On the 10th of November, he was discharged from the hospital in good health and spirits, and applied himself with very good success to acquire the profession of an engraver."

Dupuytren has invented a forceps of peculiar construction, called *enterotome*, for the purpose of bruising and breaking down by force, the sides of the two intestines, and in this way opening a passage from one to the other. Dr. Physick's operation, it appears to me, in every respect, merits the preference. Dr. Lotz of New Berlin, Pennsylvania, has succeeded, lately, in curing a case of artificial anus, by an ingenious improvement on the methods of Physick and Dupuytren.

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On Artificial Anus, Desault's Works, by Smith, vol. i. article Preternatural Ani, p. 306; Travers, on the Intestines, p. 295; Scarpa on Hernia, Memoir 4th, p. 288; Hennen's Military Surgery, 2d edit. p. 407; Dorsey's Surgery, vol. i. p. 96; Reybard sur les Traitement des Anus Artificial, 8vo.; Account of a Case in which a new and peculiar operation for Artificial Anus, performed, in 1809, by Philip Syng Physick, M. D. then Professor of Surgery in the University of Pennsylvania. Drawn up for publication by B. H. Coates, M. D., in North American Medical and Surgical Journal, vol. ii. p. 269; Lotz on Artificial Anus, in American Journal, No. xxxvi. p. 367.

CHAPTER VI.

DISEASES OF THE RECTUM.

It is but too common for students to pay particular attention to favourite subjects, and neglect others not less important. The diseases of the rectum, I have frequently perceived, are little relished; being considered not only loathsome and uninteresting, but very simple in their nature, and easily cured. Experience teaches the reverse. Many a patient has lost his life from an ill-managed fistula in ano, or from an operation upon it, unnecessarily, or improperly performed. A small portion of dissecting-room labour,—too often wasted upon the muscles,—is the proper corrective for this error.

The principal diseases of the rectum are prolapsus ani, tumours within the rectum, hemorrhoids, and fistula in ano : those less frequently met with, are imperforate anus, foreign bodies in the rectum, neuralgia, and spasms of the anus, atony and injuries of the anus, blenorrhagia, strictures and fissures of the rectum.

SECTION I.

PROLAPSUS ANI.

From habitual costiveness, straining at stool, diarrhœa, dysentery, hemorrhoids, strictures in the urethra, stone in the bladder, drastic purgatives, irritation from ascarides, and various other causes, the lining membrane of the rectum, immediately above the internal sphincter, is sometimes inverted, and protruded to a greater or less distance beyond the verge of the anus. Infants and very old people, are most liable to the complaint, which, if

the tumour be large, recent, and accompanied by much inflammation, may terminate in gangrene, or give rise to symptoms of strangulated hernia. In general, however, this result is not to be apprehended, and the disease must be considered as rather inconvenient and troublesome than dangerous. In some cases there is reason to believe that there is an *intus-susception* of the gut itself, instead of an eversion of its lining membrane.

In other instances, the sigmoid flexure, and other portions of the colon, may be invaginated and finally protruded at the anus. Even the cæcum may undergo a similar displacement. Not unfrequently, the upper part of the rectum descends and lodges in the *pouch* of the same intestine. But these affections differ, in toto, from genuine prolapsus ani. To understand the true nature of prolapsus, it should be recollected that perpetual straining from irritation, however induced, may give rise to infiltration in the cellular tissue, beneath the villous coat, and that this congestion must have the effect, finally, of causing protrusion of the lining membrane of the gut. In chronic cases of the disease, or where unusually large protrusions have taken place, there is reason to believe that the folds of the inner coat, which line the pouch or natural sinus, above the internal sphincter, and which are uncommonly numerous and relaxed, are forced by the action of the abdominal muscles from their lurking-place, and carried in volumes beyond the verge of the anus. Several cases of the kind I have seen, and one especially during the winter of 1835, at the Philadelphia Hospital, in a man thirty-six years of age, named Dubois, in whom the protrusion, equal in bulk to the fist, and of a dark red colour covered with irregular ridges and furrows, not unfrequently descended five or six inches beyond the margin of the anus.

According to Mr. Mayo, of London, not only the mucous and submucous coats of the rectum are liable to eversion, but the muscular coat also—as is proved by a preparation in the Museum of King's College, of which Mr. Mayo has furnished a drawing.

TREATMENT OF PROLAPSUS ANI.

In the treatment of this disease, it is highly important to return the protruded parts as speedily as possible. This is best accom-

plished by placing the patient on his back, elevating the hip and shoulders, and pressing gently with the fingers,—previously oiled,—upon the tumour. Should the parts be very tender and inflamed, and offer much resistance, the efforts towards reduction must be discontinued, until full benefit has been derived from general and local blood-letting, mild purgatives, cold poultices, astringent washes, &c. To support the protrusion after it has been reduced, and to prevent its recurrence, a piece of lint, covered with some mild ointment, should be applied to the anus, and over it a soft sponge and bandage. Rest, also, for some time in the horizontal position, will prove essential. Dr. Physick has sometimes cured prolapsus ani by confining the patient for a considerable time to a diet of rye mush and sugar. It must be obvious, however, from what has been stated, that much will depend upon the cause of the disease, as respects the prospect of a permanent cure ; and that so long as many of the causes pointed out continue to operate, little advantage can be gained by any mode of treatment that may be instituted. The protruded parts, now and then, become indurated and *incapable of reduction*. Under such circumstances, it may be necessary to remove them, either with the ligature or knife. When the tumour appears to be very vascular, and is small, I should prefer removing it by the double cannula and wire, as used by Dr. Physick for hemorrhoids. But when it has long remained protruded, is disorganized, and has, apparently, very little connexion with the parts within the rectum, I should resort to the operation long ago practised by *Hey*—the removal of one or more flaps, or of the whole mass, by excision. This I have practised successfully, in several cases, without inconvenience. At other times, considerable hemorrhage has followed the operation. The young surgeon should be on his guard, therefore, and take care how he ventures to cut off a large *reducible* prolapsus of the mucous membrane ; and, above all, that he does not amputate an invaginated *colon* or *cæcum*, under the idea that he is merely removing folds of the lining membrane of the rectum.

An ingenious operation, first suggested and practised by Dupuytren,—and for which, in a former edition of this work, I have failed to award him the credit he deserves,—is better calculated so far as I can determine, by a few trials of it, to effect a cure of prolapsus ani than any other ever invented. Instead of cut-

ting away the mucous membrane of the gut, Dupuytren seizes with a pair of small forceps a greater or less number of the radiating folds of skin which naturally surround the outside of the anus, and with a pair of curved scissors, cutting from without inwards, removes them. When the prolapsus is large, these folds should be pinched up in two or three different places and cut off: but in small tumours of the kind, such as are generally met with in children, the removal of two or three folds at a single spot will commonly prove sufficient. Occasionally, it is necessary to prolong the incision into the rectum as far as the point where the radiating folds are fused insensibly into the mucous membrane of that gut. The object of this operation, as will be understood immediately, is to contract—through the medium of a *cicatrix*, which must necessarily form when the wound made by the scissors has healed up—the margin of the anus, or to diminish the size of that opening, and thereby to afford a support to the loose folds of the mucous membrane of the gut they were destitute of in the relaxed condition of the parts, as usually found in cases of prolapsus. In an obstinate case of this disease in a girl three years old at the Blockley Hospital, during the winter of 1835,—and where the protrusion, the size of an egg, had been partially removed, previously, by dissecting off ribands of the lining membrane with a view of exciting the adhesive inflammation,—I succeeded in effecting a perfect cure of the prolapsus, merely by cutting away, in two places, the converging folds of skin, in the manner described.

In the case of Dubois, referred to above, I performed a similar operation; but the long standing of the disease, and the extraordinary bulk of the tumour, prevented me from succeeding.

However, as regards both the operations of Hey and Dupuytren, it should be remarked, that, if carried too far, there may be a possibility of producing such a contraction of the parts, within the rectum and at the anus, as to interfere, ever afterwards, with the evacuation of the fæces. Cases of the kind have been reported by Chesselden, and by the old anatomist Keil, where the patients could never procure a stool without the assistance of a clyster, and, even with that alternative, suffered immense'y.

It must not be supposed, from the remarks already made, that an operation will be required, necessarily, for the cure of pro-

lapsus ani. On the contrary, many cases occur, in children especially, where, by early attention to the disease, the use of saturnine and astringent injections, keeping the bowels in a soluble state, and, above all, by obliging the child to evacuate the fæces whilst in a *standing position*, perfect cures will be effected in a few weeks or months.

Perforated ivory balls, gum elastic and other pessaries, the craw of a turkey, lint plugs, sponges, steel trusses, and other contrivances have been resorted to for sustaining the prolapsed parts, or for effecting radical cures through the medium of adhesive inflammation, but generally without effect. As some patients, however, have derived benefit, undoubtedly, from them, they should in certain cases be tried. But if, upon trial, they are found, as is generally the case, to act as *suppositories*, they will do more harm than good, and should be abandoned.

On Prolapsus Ani, consult Monro's Essay on Procidentia Ani, in Edinburgh Physical and Literary Essays, vol. ii. p. 353 ; Chesselden's Anatomy of the Human Body, 1792 ; Chevalier on relaxed Rectum, in Medico-Chirurgical Transactions, vol. x. p. 401, 1819 ; Sabatier, Mémoires sur les Anus Contrè Nature, in Mémoires de la Académie Royale de Chirurgie, tom. xv. 12mo. edit. ; Hey's Practical Observations in Surgery, p. 438, London, 1814 ; A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate, and Rectum, by C. Bell, with Notes by J. Shaw, p. 324, London, 1820 ; Dupuytren on Prolapsus of the Rectum, in Clinical Lectures on Surgery, at Hotel Dieu, &c., translated by Doane, p. 99 ; Observations on Injuries and Diseases of the Rectum, by Herbert Mayo, p. 28, London, 1833 ; American Cyclopædia of Practical Medicine and Surgery, edited by Isaac Hays, M.D., Part vi. p. 95, Philadelphia, 1835 ; Colles's Surgical Anatomy, p. 139.

SECTION II.

TUMOURS WITHIN THE RECTUM.

Sarcomatous and other tumours occasionally sprout from the surface of the lining membrane of the rectum, and according to their bulk and figure, excite more or less irritation, diarrhœa, &c. Sometimes they originate between the coats of the intestine. Mr. John Bell* speaks of enormous tumours of the rectum, soft, woolly, lubricous, of a shining red colour, involving the whole circle of the anus, extending beyond it many inches, and retiring deeply within the cavity of the gut. Such I have not seen.

TREATMENT OF TUMOURS WITHIN THE RECTUM.

When the tumour originates by a very narrow pedicle, and moves freely about, it may sometimes be pulled away with a pair of forceps; but when its base is broad, the ligature will prove the safest and most effectual remedy. It will answer no purpose, however, merely to encircle the swelling with a single cord. Many years ago, I was consulted by a gentleman of Maryland, on account of a fleshy excrescence, about the size of an egg, which arose from the walls of the rectum an inch and a half above the sphincter ani. A surgeon of eminence had undertaken to remove the tumour by a single ligature; but, unable to noose the base of the swelling, the anterior part only was destroyed, and the operation proved fruitless. I determined to proceed in a different way. Directing the patient to sit for half an hour over a tub of warm water, and by straining, to force the tumour as far as possible below the sphincter, I passed a crooked needle, armed with two ligatures, through its substance, as near as possible to the coats of the bowel, and tied one on

* Principles of Surgery, vol. iii. p. 188.

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each side. In four or five days the diseased mass sloughed away, and a perfect cure followed.

By similar means I have removed, repeatedly since, both large and small tumours, and almost invariably with success. The knife, upon such occasions, should never, I think, be employed, on account of the hemorrhage which would be almost certain to follow the extirpation of a vascular tumour within the walls of the rectum, and the difficulty which the surgeon would experience, necessarily, in securing the vessels in that situation. The advantage possessed by the double, over the single ligature, is, that two portions of the tumour being embraced, at the same moment, the sloughing will be accomplished with greater rapidity than if the whole mass were encircled. Besides, the ligatures having been passed through the substance of the tumour, cannot be detached until the tumour is removed.

On Tumours of the Rectum, consult C. Bell's Operative Surgery, vol. i. ; J. Bell's Principles of Surgery, vol. iii. p. 191 ; A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate, and Rectum, by C. Bell, p. 323.

SECTION III.

HEMORRHOIDS.

HEMORRHAGE, occasional or periodical, from the verge of the anus, or from the cavity of the rectum, is very common among persons of indolent and sedentary lives, and of full habits of body. Costiveness, pregnancy, severe exercise on horseback, and many other causes may give rise to the complaint. It is still a disputed point whether the blood proceeds from varicose distention of the hemorrhoidal veins, or is poured into cysts formed of the cellular membrane, between the coats of the bowel, or beneath the integuments of the anus. Both opinions are, I am sure, well founded. In by far, however, the greater number of instances, hemorrhoidal tumours are formed by enlargement of the veins of the rectum. This varicose condition of the veins is brought about, there is reason to believe, by repeated straining at stool, during which the sphincters are of necessity relaxed, so that a column of blood, unsupported by valves, and driven by the action of the abdominal muscles against the mesenteric veins, dilates, and not unfrequently, bursts them. In the course of time, from repeated attacks of inflammation, coagulable lymph is thrown around the distended veins, their coats are thickened, and fleshy tumours created, which enclose the veins in their substance, and either diminish, or obliterate, altogether, their cavities. But more or less of the cavity of the vein generally remains concealed within the tumour, and often this cavity is much larger than the original vessel, and, if opened, will shed blood profusely. Hemorrhoidal tumours, so long as they remain within the cavity of the rectum, are mostly free from pain; when they protrude, however, beyond the anus, and are compressed by its sphincter, they frequently become exquisitely sensible and enlarged. The margin of the anus is sometimes surrounded by a cluster of tumours of

a dark red or purple colour; at other times only a single pro-
tuberance is visible.

TREATMENT OF HEMORRHOIDS.

The remedies for this disease are either palliative or radical.
Among the former may be enumerated leeches, cold astringent
washes, astringent ointments, rest in the horizontal position,
mild laxatives, general blood-letting. In several instances I
have derived great benefit from a poultice made of the pulp of
the green persimmon, and also from a decoction of the bark of
the persimmon-tree. The extracts of stramonium, and bella-
donna, I have used for twenty years, and have found, in parti-
cular cases, extremely soothing, and useful. Internally admi-
nistered, there is nothing better than the old remedy extolled by
Benjamin Bell—the balsam copaibæ.

When hemorrhoids become large and troublesome, or irre-
ducible, an operation will be required. The knife, or ligature,
will prove equally successful. The use of the former, however,
is sometimes followed by profuse hemorrhage, violent inflam-
mation, and even death. Three instances of fatal termination
are related by Sir Astley Cooper. The first was that of a lady,
who died in a week from peritoneal inflammation, induced by
the removal of a single pile by the scissors; the second that of
a gentleman who died from hemorrhage on the second day after
the operation. In the third case, Sir Astley removed a large
hemorrhoid by the scissors from the anus of a nobleman. " In
about ten minutes after the operation, he said, ' I must relieve
my bowels,' and he rose from his bed and discharged into the
close stool what he thought to be fæces, but which proved to be
blood. In twenty minutes he had the same sensation and
evacuated more blood than before; in about the same lapse of
time he again rose, and soon became very faint from the free
hemorrhage. I therefore opened the rectum with a speculum,
and saw an artery throwing out its blood with freedom. I there-
fore requested him to force down the intestine as much as he
could, and raising the orifice of the bleeding vessel, with a
tenaculum, secured it in a ligature and also compressed the
artery with a piece of sponge. His lordship bled no more. On

the following day he was low, his pulse very quick, and he had a shivering; on the next day he complained of pain in his abdomen; he had sickness and tenderness upon pressure, and in four days he died."

Similar cases have been reported by other writers, both in this country and in Europe. When we recollect, indeed, that piles consist, in nine cases out of ten, of dilated veins, and that there are no valves from the anus to the liver, so that the whole column of blood must press upon the rectum, it is only surprising that surgeons, knowing these facts, should undertake to operate as often as they do, with the knife and scissors, and that a much greater number of accidents have not been met with. The latter circumstance can only be accounted for by the fact that tumours, which were originally varicose veins, have become obliterated by adhesive inflammation, or been converted into disorganized masses of cellular membrane, veins and skin, and that when, under these circumstances, clipped off by a cutting instrument, have shed little or no blood. Such being the case, it is important to draw a distinction between a cluster of dilated veins, within the sphincter, or projecting beyond the margin of the anus, and those lifeless indurated growths, which so often occupy the same situations. The latter may be safely cut away; but the former never can, without imminent risk of the patient's life.

It is true that whilst most eminent surgeons are adverse to the removal of *venous* hemorrhoids by the *knife*, one or two others, equally eminent, have advocated the practice when conjoined with collateral means. Thus, Dupuytren, the magnus Apollo of French surgery, has boldly recommended and practised not only the removal of piles by cutting instruments, but the application of the actual cautery, immediately afterwards, for stemming the torrents of blood. His own mouth has sufficiently condemned, we think, both the operator and the operation. "I have seen you," says he in his Lectures, "shudder more than once at the sight of the red-hot iron, and at the cloud of smoke which arises from the cauterized part: you may judge what an impression such a preparation would produce on the friends and relations of the patient, who are not, like you, accustomed to such scenes." Again: "It is also to avoid this disastrous occurrence—*hemorrhage*—that we make it a rule not to

apply the dressings for some hours after the operation, because it is to be feared that the dressings would only hinder the blood from flowing out, and thus cause it to flow back into the superior intestines." What we apprehended happened the next day; an internal hemorrhage manifested itself; the pupil of the ward was not mistaken. He gave him (speaking of a particular patient,) an enema, which brought away a great quantity of blood; a second enema brought a considerable clot. He then made the patient strain first to expel any blood that might remain, and, secondly, to cause relaxation of the sphincter, and exhibit the surface of the divided arteries; then he applied to the bleeding parts two red-hot iron instruments. The quantity of blood lost in this operation has been estimated to be three, four, and five pounds. It flows into the descending, the transverse, and the ascending colon, and as far as the cæcum, but never beyond this. From the effect of the cauterization he experienced a retention of urine, and it was necessary to use the catheter. After the evacuation of a great quantity of urine, he felt violent pain, which did not cease until the organ returned to its usual state. Again: a very wealthy banker is attended by Dupuytren, who, with a pair of large forceps, pulls down the hemorrhoids and cuts them off. "At the end of a quarter of an hour, the patient became pale, fell into a state of extreme weakness, the pulse small and hard, a cold perspiration covered the body, and he felt a sensation of heat in the abdomen, continually ascending. The professor immediately recommended the patient to make expulsatory efforts, and a great quantity of scarcely coagulated blood was discharged. Cold injections were useless; the hemorrhage was not stopped: then a pig's bladder, stuffed with lint, was introduced. This succeeded completely: but it was not without great difficulty it could be kept in its place; involuntary expulsatory efforts tended incessantly to displace it, and actually did so several times. This hemorrhage weakened the patient very much, and would *undoubtedly have been fatal*, if it had not been arrested so promptly." The banker's brother had a similar disease, is treated in a similar manner, and would certainly have died, but for the presence of mind of another brother, who, in the absence of the surgeon, introduces the pig's bladder, and stops the blood. " But the loss of blood was so great that the patient was a *long*

time before he recovered." In another instance, a Scotchman, an officer of dragoons, is subjected to excision. " There were three tumours not very voluminous, and as there was but a trifling effusion of blood, M. Dupuytren thought that cauterization might be dispensed with. About five hours after the excision, all the characteristic symptoms of hemorrhage in the rectum were manifested : *anxiety, rigors, inclination to vomit, cold perspiration, sinking of the pulse, convulsive contraction of the limbs, inexplicable agony, vertigo, syncope, tremors* increasing, the patient went to stool, and the expulsion of a considerable quantity of partly coagulated blood, gave him visible relief. At the expiration of about an hour the symptoms returned with increasing intensity; they produced complete *collapse.* The patient requested a notary should be sent for, and hastened to arrange his affairs, preferring death, which he thought inevitable, to cauterization. With the aid of the speculum, the place from whence the blood flowed was easily found, and the effusion stopped by the application of a bent *cauterie en haricot* heated to a white heat ; a wick was kept in the rectum, and in a few days the patient was perfectly cured." Other cases are reported, in favour of *excision* and the *cautery ;* but the details correspond so exactly with each other, that it is superfluous to state them. Besides, the disastrous effects of *excision* and the *cautery,* already pointed out, it should be mentioned, (and the fact is admitted by Dupuytren,) that contraction of the anus, to such a degree as greatly to interfere with the patient having a stool, not unfrequently follows. Under all these circumstances, may we not exclaim, Cui bono ? Why subject an unfortunate individual to such torture ? Why give rise to hemorrhage, merely for the sake, apparently, of showing our dexterity in stopping it ?

The *ligature*, then, in our estimation, is the only safe operation, for the generality of hemorrhoidal tumours. As practised by the older surgeons, and by most of the moderns, there can be no doubt that inconvenience, and sometimes very severe pain, and other unpleasant symptoms, follow its application ; but that any thing like the consequence spoken of by old Petit, and handed down from one generation to another,—symptoms of strangulated hernia, and death—ever follow from performing the operation as it ought to be performed, or even when performed in the most bungling manner, I am very far from believing.

To the late Dr. Physick we are indebted for the best mode of performing this operation. A double cannula of the ordinary form, but only *two inches long*, is selected, and " a piece of tough, flexible, pure iron wire, one twenty-fourth part of an inch, or rather less, in diameter, having firmness enough to allow of its being pushed backwards and forwards in the cannula," is passed through both barrels of that instrument, and whilst one end is secured at the ring of the cannula, the other remains loose. A loop being formed adapted to the size of the hemorrhoid, is passed around it, and then drawn as *firmly as possible*, by pulling upon the extremity of the wire projecting from the lower end of the cannula with a pair of flat pliers, and then securing its end to the opposite wing. In twenty-four hours, or sometimes twelve, the wire is loosened from the wing of the instrument, straightened by the pliers and cautiously pushed back, and its loop disengaged from the tumour, which by that time is commonly found black, shrivelled, and free from pain. A poultice is then applied, and in a few days the tumour is entirely separated. The *peculiarity*, it will be perceived, of the above operation, consists in the *unusual firmness* with which the wire is drawn, and its being removed in a few hours, instead of being suffered to remain for *several days*. " No one can properly appreciate," says Dr. Physick, " the advantages resulting from the above method of removing hemorrhoidal tumours, who has not seen them treated, by allowing the ligature to remain during the separation of the part. Under that mode of operating, the patient is never at ease during the whole time; the discharge of the fæces is often excruciating, even moving in bed is dreaded, and in the last case in which I performed the operation in that manner, the convulsive twitchings of the lower extremities, which were induced, became so frequent and violent, that I was uneasy, through an apprehension of tetanus being the consequence. It seems to me probable, that one reason of the difference between the effect of the wire, and a common ligature may be, that, however firmly the waxed ligature may be drawn and tied on the base of the tumour, before a second knot can be tied to secure the first, the elasticity of the parts compressed opens the first knot a little, and of course the exclusion of blood, and nervous influence is not so complete as when the wire is used, which can be fastened on the arm of

the instrument at the time when it is drawn round the swelling as tightly as possible. The pinch given by the wire is soon destructive, and any degree of restoration is rendered impossible.

" It might be supposed, if a thread were used, it could be cut off after a short time ; but the swelling comes on so speedily, the parts retract so much within the anus, and are so extremely tender to the touch, that it is difficult to find the noose : when found, the operation of dividing it either with knife or scissors, is productive of so much pain, that I have known some patients refuse to submit to it. The removal of the wire occasions no pain. It may be proper to mention, that when the tumour happens to be attached to the inside of the anus, anteriorly, some difficulty in voiding urine is often complained of; but this symptom, always, in my patients, has subsided immediately after the removal of the wire. Where," Dr. Physick further remarks, " hemorrhoidal tumours are only protruded in the act of evacuating the fæces, then their *excision* would be attended with great risk of hemorrhage. This some have denied, but having twice witnessed the fact to *a very alarming extent*, I wish, on all occasions, to guard against it."

For many years I have practised the operation just described, both on small and large hemorrhoidal tumours, and in a great many instances, and can positively declare, that, although I have often known very sharp, and severe pain to follow the tightening of the ligature in some, that in others very little complaint has been made, and that in all very perfect and speedy cures have been accomplished. In proof of this, I shall relate a case which, I think, will be acknowledged to be equal in extent to any reported by Dupuytren.

Mr. B., a respectable merchant of Danville, on the Susquehanna, had suffered for fifteen years with internal hemorrhoids. His constitution was naturally very fine and vigorous, but from repeated hemorrhages from the rectum, he had become emaciated, and so debilitated, and suffered so much pain from the protrusion of the tumours, that he could scarcely attend to his business, and life had almost become a burden to him. When I saw him, his skin was of a pale yellowish hue and his whole aspect cadaverous. After resting a few days, to recover from

the fatigue of his journey, he was directed to sit for half an hour
over a bucket of warm water, and force down gradually the
tumours. They came out, and as they descended became ravelled
up into rolls, each as thick as the thumb, covered with blood and
sero-purulent matter. There were two or three masses which
completely surrounded the verge of the anus, but which pre-
sented, when superficially examined, an irregular, tuberculated,
dark purple, very vascular, highly sensitive tumour, as large as
the fist. The patient was put to bed, a gentle aperient ordered,
and the next day, immediately after the tumours (by straining
over warm water) had been forced down, was laid on his side
over the edge of a bed, and the largest and most painful mass
selected, included in the iron wire ligature, as near its base as
possible, and the wire drawn with all the force I was master of.
The pain, for an instant, was agonizing; but soon subsided—
owing to the death of the tumour, thus so suddenly brought about.
In fifteen or twenty hours, the wire was removed, and a warm
poultice applied to the parts. In four days the remains of the
tumour were completely separated, and the patient returned
home in a fortnight, perfectly cured of the protrusion and of
the hemorrhagies, and in a few months recovered his health.
Seven or eight years have now elapsed since the operation; and
I have never heard of his having had a return of this complaint.
It may be asked what became of the remaining tumours. They
were obliterated, by the supervention of the adhesive inflam-
mation—a fact very important to be known, and an occurrence
by no means uncommon. Aware of this, the surgeon should
always make it a rule never to include numerous hemorrhoids,
or a very large mass, in a ligature, at a single operation, (in
order to guard against violent symptoms,) but take his chance of
curing all by one operation, and of repeating it, subsequently,
should the remaining tumour require it. A case, in some re-
spects similar to that of Mr. B., I operated on, in presence of
Dr. Physick, eight years ago, and with the same happy result.
The patient, Mr. W., long before and since the operation, a
most valuable officer of the government at Washington, had
determined to abandon his office, unless he could have obtained
relief.

In conclusion I may remark, that no surgeon can properly

appreciate the value of the ligature unless he use it according to the principles first pointed out, and unless he fulfil the most important indication—*to draw the wire with very great firmness.*

It would be unfair, however, not to state, in addition to what has been said in relation to the *ligature* and the *knife,* that there are many surgeons in this country who still prefer the latter operation, notwithstanding the reported cases of serious consequences resulting therefrom. In particular I may remark, that Dr. John C. Warren, the distinguished professor, of Boston— the extent of whose practice has been equal, perhaps, to that of any surgeon in the United States, and whose attainments, judgment, and skill are unquestionable—informs me that he has removed, by excision, one hundred and sixty hemorrhoids, and excised and tied thirty-five, without ever having met with an unpleasant symptom.

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On Hemorrhoids, consult Abernethy on Hemorrhoidal Diseases, in Surgical Works, vol. ii. ; Earle on Hemorrhoidal Excrescences, 1807 ; Kirby on the Treatment of Hemorrhoidal Excrescences ; Ware on the Treatment of Hemorrhoids ; A Practical Treatise on Hemorrhoids, &c., by George Calvert ; The double Cannula and Wire recommended in the Operation of Extirpating Scirrhous Tonsils and Hemorrhoidal Tumours, by Philip Syng Physick, M. D., in Philadelphia Journal of Medical and Physical Sciences, vol. i. p. 17, 1820 ; Excision of Hemorrhoidal Tumours, in Clinical Lectures on Surgery, by Dupuytren, translated by Doane, p. 105, Phil. 1833 ; Observations on Injuries and Diseases of the Rectum, by Herbert Mayo, p. 53. London, 1833,

SECTION IV.

FISTULA IN ANO.

When an abscess forms in the cellular membrane surround-
ing the rectum, or about the verge of the anus, and leaves, after
its contents are discharged, one or more small openings com-
municating with its cavity, the disease is denominated fistula in
ano.   Other appellations have also been invented, expressive of
the particular situation of the fistulous orifice, and the extent
of the disease.   If the fistula opens upon the surface of the in-
teguments, it is called an *incomplete* fistula; if it communicates
with the rectum and not with the integuments, an *internal* fis-
tula; and when there is an opening in the gut and another through
the skin, a *complete* fistula.

The formation of a fistula in ano is often denoted by rigors,
a painful swelling about the ischium or perineum, difficulty of
passing urine, and by irritation of the rectum and neck of the
bladder.   During the progress of the disease, the patient, in
many instances, suffers immensely; at other times, the abscess
forms and breaks almost without the patient being aware of its
existence.   Generally the abscess communicates with the in-
teguments by a single opening; occasionally three or four are
met with; and I once attended a case of long standing, in which
there were no less than fifteen.   In healthy constitutions the
abscess does not differ from that of the common phlegmon, met
with in other parts of the cellular tissue.   In consumptive and
scrofulous patients, however, the disease often assumes a dif-
ferent shape.   The surface of the integuments is covered with
an erysipelatous inflammation, the fever, sickness, and pain are
very considerable, the matter is discharged in small quantity,
from a sloughy, ill-conditioned opening, or from a ragged
unhealthy surface.   The origin of fistula in ano cannot be
always satisfactorily traced.   Sometimes it arises from irritation
about the rectum, from local injury, from the lodgement of
undissolved articles of food taken into the stomach, and passed

through the intestines as far as the rectum, such as the bones of fish or fowls. Severe and long-continued exercise on rough-going horses, I have sometimes known to lay the foundation of the complaint. Hemorrhoids, there is reason to believe, often contribute to the disease. The same may be said of severe colds and coughs.

TREATMENT OF FISTULA IN ANO.

An opinion very generally prevails that every fistula in ano requires an operation. There cannot be a greater mistake. So far from it, almost every sinus, I am inclined to think, in a patient tolerably healthy, might be healed, if attended to in the commencement, and judiciously managed. Nothing will contribute more to this end than absolute rest, simple dressings, moderate diet, and mild laxatives. I have known a fistula, —protracted and kept open for months while the patient walked about,—healed in a week by perfect quietude, and the horizontal position.

It frequently happens, however, that the surgeon is not called until the disease is firmly established, and an operation urgently demanded. But, before he undertakes it, the operator would do well to soothe the parts, and reduce the inflammation and callosity about the sinus by emollient poultices, and after the irritation has subsided, gradually enlarge the fistulous orifice by bougies, (if necessary,) before an examination with the probe is entered upon. If these precautions are neglected, and the fistula probed at once, the patient will suffer, as I have often witnessed, immensely, and, indeed, will experience infinitely greater pain than from the operation itself. It will still remain to inquire concerning the patient's general health. If consumptive, the operation can answer, generally, no good purpose; on the contrary, it will aggravate, if the fistula should be healed, all the pectoral symptoms.

When determined upon, the operation may be performed, by a common probe-pointed bistoury, by the sheathed bistoury of Dr. Physick, or by the knife of Cruikshank. The objection to the *probe* bistoury is, that it will sometimes be necessary, when there is no opening between the gut and sinus, to *make* one.

For this purpose, an instrument with a sharp point will be required. Dr. Physick's instrument was constructed with this view, and possesses the additional advantage, from being covered by a silver sheath, blunt on its edges, of not cutting the tract of the sinus whilst passing along, until the operator desires so to do. Cruikshank's bistoury is constructed with a moveable stilet that can be pushed forward or retracted at pleasure, the point of which is intended to pierce the gut, and then to be withdrawn, that the surgeon's finger may rest on the blunt extremity of the knife.

Previous to the operation, the rectum is emptied by a clyster, and the buttocks being turned towards the light, are held asunder by assistants, while the patient stoops forward and rests his body and arms upon the table. The surgeon introduces a fore-finger, oiled, into the rectum, passes the probe into the sinus, examines carefully its situation and extent, and having satisfied himself thoroughly in this respect, carries the sheathed bistoury, (for example,) as high as the naked outer surface of the intestine, then disengages the sheath from the bistoury, and removes it from the sinus. The point of the bistoury is next pushed through the gut, and made to rest on the finger within the rectum. Both the finger and knife are next withdrawn, the latter dividing in its passage downwards, the whole track of the sinus, the intestine, sphincter ani muscle, and integuments, and leaving a chasm of considerable extent. A dossil of lint should be next introduced between the lips of the wound, and the patient put to bed. The cure is afterwards completed by mild dressings. When there is an opening in the gut, and another at the margin of the anus, or on the buttock, with an intermediate communication by a sinus, constituting *complete* fistula, no other instrument than the common probe-pointed bistoury will be required for the operation.

In performing the operation for fistula in ano, simple as it is considered, the operator must remember, that if he prolongs his incision too far upwards from an over anxiety to trace every ramification of the sinus,—a very unnecessary piece of work,— he may wound the peritoneum, lay open the cavity of the abdomen, and also divide the internal hemorrhoidal artery.

The *ligature*, is frequently employed, instead of the knife, for the cure of fistula in ano. As it requires, however, a much

longer time to effect its purpose, and is, withal, sometimes pain-
ful and inconvenient, there are many patients unwilling to sub-
mit to the operation. But cases present themselves now and
then, in which the knife could not be employed without risk of
hemorrhage, or in which from the number and depth of the
sinuses, it would be impossible to trace them, or if traced, diffi-
culty would afterwards be experienced in making them heal
from the bottom or in preventing the formation of new sinuses.
Under these, and some other circumstances, it has been custo-
mary, particularly among the French, from time immemorial,
to resort to the ligature. The material of which it is made, as
well as the instrument for conveying it, have varied exceedingly
in different ages. Hippocrates used a linen thread wound upon
a horse-hair, others employed silver or iron wire, and many
preferred leaden wire to any other kind of ligature. Some con-
veyed the ligature by means of a silver probe, others by a can-
nula. Forceps for seizing the wire within the gut, and stilets
for making an opening into the gut for the transmission of the
ligature, have also been used. But, in many instances, it will
only be necessary, when this operation is determined on, to pur-
sue the following simple plan, one which has been practised for
a great many years by D:. Physick, and which experience has
taught him to be almost always successful. A common pocket-
case probe, of the same thickness throughout, is slightly ragged
at one end with a knife or file, and a piece of braid secured to
it by thread, in the same way that the line is fastened to a fish-
hook, is introduced into the fistulous orifice and conveyed along
the sinus into the gut. The probe is next bent upon a finger,
(previously passed into the rectum,) and brought out along with
the lig ture at the anus. The latter is then removed from the
probe and its ends *loo ely* tied. After the lapse of a few days the
ligature is moderately tightened, and occasionally afterwards,
(once a week, for example,) the constriction is repeated and
increased until the parts within its embrace are completely de-
stroyed, and the cord, sua sponte, detached. The small ulcer
left, soon heals up. Sometimes the ligature comes away in four
or five weeks; at other times, eight or ten months elapse before
the loop separates. In the meantime, however, the patient is
generally permitted to walk about and attend to his business. In
cases where no communication exists between the rectum and

fistula, Dr. Physick has been in the habit of making one, by means of a sharp-pointed sheathed knife, previously to the introduction of the probe and ligature.

In peculiarly irritable patients, however, I have found it very difficult to carry the eyed-probe and ligature through the orifice in the gut without producing excessive pain in the act of bending the probe within the rectum, and which must always be done before it can be brought out at the anus. To obviate this difficulty, I invented ten years ago, the following instrument, which I have employed ever since, upon all occasions, where I have thought it necessary to use the ligature in preference to the knife, both in hospital and private practice, and with the greatest success, and least possible inconvenience to the patient. A silver cannula, moderately curved, about five inches long, the eighth of an inch wide in its longest, and the sixteenth of an inch in its shortest diameter, is intended to convey a narrow watch-spring, ten inches long, having at the extremity next the handle of the cannula an eye, and at the other a small bulbous silver point. An additional spring, differing only from the first in the silver end being small enough to pass along with the spring through the cannula, and intended for *incomplete* fistula, accompanies the instrument. A steel stilet, which fills up the cannula, and projects in the form of a small lancet, just beyond the extremity, completes the contrivance. (See Plate V.)

If it be intended to operate on a case of *incomplete* fistula— that in which there is no opening in the gut—the cannula, armed with the stilet, and its point retracted, is entered at the fistulous orifice, conveyed carefully along the sinus until that portion of the side of the rectum is reached where it is designed to make the perforation. The stilet is then pushed through the walls of the gut, and is felt within by the finger previously introduced into the rectum. Having withdrawn the stilet, the spring with the flattened silver end, armed with very narrow braid is conveyed through the cannula, and, guided by the finger in the rectum, brought out at the anus along with the ligature which is then separated from the eye of the spring, and its ends loosely tied. In cases of *complete* fistula, the *stilet* will not be required, and the spring, with the bulbous end, previously placed in the cannula, and armed, as already described, with

Plate V. Vol 2.
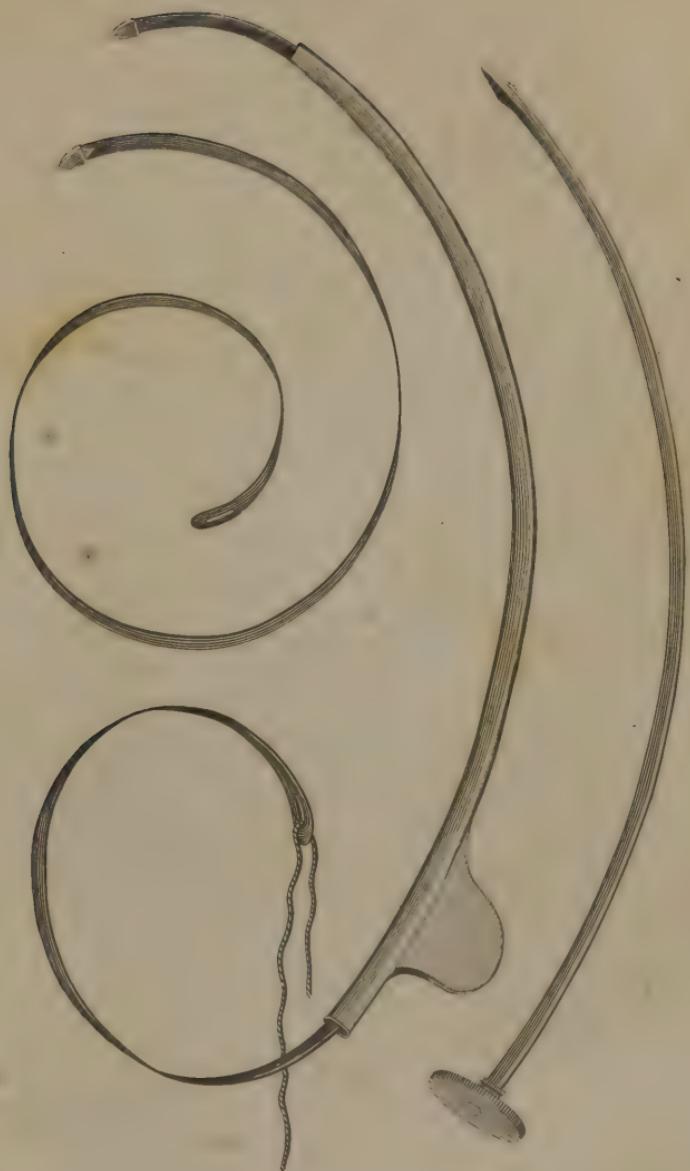
braid, may be employed. In either case it must be obvious that the pressure which gives the patient so much pain when the probe is used, is taken off the fistulous *orifice* and borne by the *cannula ;* and, besides, that the spring has a natural tendency, by forming a curve as it is pushed onwards, to avoid pressure, and to reach the anus with the greatest facility.

The *ligature* is often adapted to those cases in which a fistula follows, or is conjoined with phthisis pulmonalis. Under an impression that the pulmonary affection is dependent upon, or aggravated by the fistula, many patients are extremely anxious to have an operation. I have invariably refused to employ the knife upon such occasions, but have sometimes gratified them by operating with the ligature, which, by being worn for months together is someti es so far serviceab e as to prevent the formation of other abscesses in the neighbourhood of the rectum, and by keeping up a steady drain throughout a single track, to relieve the cough and other constitutional symptoms. The worst case of fistula in ano I ever saw, I attended along with Dr. Physick, several years ago,—that of a Mr. W. from the neighbourhood of Lynchburg, Virginia. The patient's whole family had been carried off by phthisis, and several of them had laboured under fistula in ano. In Mr. W., the only remaining one of his race, there was strong premonitory symptoms of consumption, and for months he had suffered from profuse discharges of sanious, gleety, offensive matter from the rectum, all the parts about which I found indurated, covered with sinuses, and fistulous openings, with extensive ulcerations within the gut, destruction of all its coats in particular spots, and the whole rectum more or less insulated by the destruction of the surrounding cellular membrane, so that it might have been said to have floated loosely in a large bag of matter. I trimmed away many of the loose-hanging portions of the rectum and disorganized cellular tissue, and endeavoured to reach by the finger and by probes the bottom of the sinuses ; but found it impossible, owing to their great depth. In consultation it was determined that there was every probability of the patient sinking under his disease, and all that could be done for his relief would be to introduce a large cord high up the gut, and let it remain several months. This was accordingly done by Dr. Physick, and the patient returned home. The seton, thus left, had the effect of consolidating, through the medium of adhesive inflammation, all the loose parts,

and, finally, contrary to our expectations, the external fistulous openings were obliterated, the sinuses healed up, and the patient now enjoys, comparatively, good health.

When the *knife* is employed for the cure of fistula in ano, it effects its purpose by promoting the granulating process, by first dividing the *sinus*, which, so long as it remained lined by a secreting membrane, would never have been obliterated, and lastly, by dividing the *sphincters* of the gut, thereby rendering them quiescent, and preventing that incessant motion about the anus, so well calculated to interfere with and to break up the granulations as soon as they are formed. *Rest*, then, so essential in the treatment of many other diseases, is peculiarly so in fistula in ano. Though the sphincters unite very readily, in most cases, after the operation by the knife, it sometimes happens that they remain separated, a deep fissure is left, and the patient cannot retain his fæces as perfectly as he had been accustomed to. It is extremely difficult under these circumstances, to restore the use of the parts. In obstinate cases of the kind, I should think the surgeon justified in cutting away the edges of the chasm, as in hare-lip, and endeavouring to unite them by suture.

In conclusion I may state, that many very useless and complicated instruments have been invented for fistula in ano, that, generally, I have found a simple bistoury, having a shoulder and at the same time a small sharp point under it, sufficient for the purpose; that I have, also, used advantageously the French method—by the wooden gorget and silver director instead of the finger, a plan always employed by my intelligent friend, Professor May, of Washington—and upon the whole have been particularly careful to use a knife not likely to break—an accident that happened to Liston, myself, and others.

On Fistula in Ano, consult Desault's Works, by Smith, vol. i. p. 330; Pott's Works by Earle, vol. iii. p. 45; A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate, and Rectum, by Sir Charles Bell, with Notes, by John Shaw, Surgeon, Demonstrator of Anatomy, in the School of Great Windmill Street, London, 1820, 8vo. page 297; Copeland's Observations on some of the Principal Diseases of the Rectum and Anus, Philadelphia, 1811; Practical Observations on the Symptoms, Discrimination and Treatment of some of the most Common Diseases of the Lower Intestines and Anus, by John Howship, London, 1820; Observations on Injuries and Diseases of the Rectum, by Herbert Mayo, p. 28, London, 1833; Sir Astley Cooper's Lectures by Tyrrel, vol. ii. p. 336.

SECTION V.

ENCYSTED RECTUM.

Within the cavity of the rectum, between the internal and external sphincters, commencing at the margin of the former, are, naturally situated, a number of small sacs, or pockets, the orifices of which look upwards, while the bodies of the sacs descend towards the anus, perpendicularly, are about a quarter of an inch in length, and have a cul de sac termination. The number of these minute pockets is in proportion to the number of grooves, situated between the columns of the rectum, and each groove terminates in its corresponding pocket. In general, from seven to thirteen sacs are found, all which are covered and lined, by the mucous membrane of the gut. These sacs are filled, there is reason to believe, with *mucus* (poured out by the numerous adjoining follicles) which is pressed out of their cavities during the passage of the fæces, and serves, probably, to lubricate that portion of the anus covered by cuticle. According to Ribes, such sacs had been noticed by Ruysch, Morgagni, and Glisson, as being accidentally met with in the rectum upon certain occasions. Ribes himself was unable to find them, although he had made numerous dissections for the purpose, during the period of twenty-five years. Subsequently, he was more fortunate, and was able to find in one subject three, and, in another, four of these *lacunæ*, but which he has not described with perfect accuracy. It remained for Dr. Horner to establish the fact, by numerous and most satisfactory examinations, that—what the anatomists, referred to, considered as accidental occurrences—these sacs exist invariably, and form a portion of the natural apparatus of the rectum.

So far back as the year 1792, Dr. Physick met with a peculiar disease of the rectum, which had never been described or noticed by writers. It consisted of one or more sacs, of different dimensions, which, by bending a probe upon itself, introducing it into

the rectum, and hooking it into the mouth of the sac, could be
drawn down and made to appear on the outside of the anus.
From that period he was accustomed to speak of this case—and
others, which he subsequently met with—in his surgical lectures
in the University of Pennsylvania. From that period his ex-
perience in the complaint had been very considerable, a great
number of cases having occurred in his own practice, and in
the practice of others by whom he had been consulted.

From what has been said, it will be readily inferred that this
disease, to which the attention of Dr. Physick was originally
drawn, must consist in an expansion, or dilatation, of the small
natural sacs of the rectum, described in the commencement of
this section. Such, we have every reason to believe, to be the
fact, though, strange as it may seem, no dissection has ever yet
been made, so far as we are acquainted, calculated to *demon-
strate* that the *preternatural* pouch is an actual enlargement of
the *natural* one. From the circumstance, however, of small
portions of fæces, or foreign bodies, such as seeds, having
been found in the dilated sacs at the time of operation, it is
more than probable that these articles, by finding their way
occasionally into the natural pockets, may, by irritating them,
cause their expansion and elongation, and produce the disease in
question. Dr. Physick, himself, seemed inclined to believe that
" they commence in the same manner with one of the forms of
hemorrhoidal tumour. The constriction of the sphincters which
embarrasses the venous circulation of the part, aided by the
pressure exerted in passing different stools, frequently give rise
to ecchymosis beneath the integuments. The effused blood pro-
duces no irritation of the cellular tissue in which it is placed, but
forms for itself a simple inert receptacle. If the blood is neither
absorbed nor discharged, but remains or becomes enlarged, by
successive ecchymoses, it constitutes (certain authorities to the
contrary, notwithstanding,) one form of the hemorrhoid. If, on
the other hand, some accident, or the absorption of the integu-
ment, gives exit to the blood, after the cavity has become accus-
tomed to its presence, the cellular tissue shows little disposition
to reunite, no obvious marks of inflammation appear, and a
preternatural cavity is established. In support of this explanation,
which is urged with characteristic caution, as an hypothesis, Dr.
Physick states that in the early part of his practice, he has, in

several instances, operated on hemorrhoidal tumours of the same part, in which, after the removal of the coagula, the part presented precisely the same aspect with the preternatural cavities, wanting only the orifice. He refers, also, to the existence of similar cavities after the discharge of ecchymoses of the scalp, such as most surgeons must have seen, particularly in children, and which often prove tedious and difficult of cure: he has also witnessed the same accident in other parts of the body. In most cases the first appearance of the cavities was preceded by troublesome piles."*

It generally happens that patients troubled with sacculated rectum, have complained for weeks, or months, of uneasy, disagreeable sensations, (resembling those created by the nestling of ascarides, within the gut,) or of extraordinary itching about the anus. Others complain of a sense of pressure or weight upon the extremity of the rectum. *Pain* is seldom felt until the disease has existed for some time, and even then is not generally noticed until a short time after the passage of the fæces. It does not, however, follow *every evacuation*, and the patient may be free from it for whole days together. Sometimes it is extremely severe. For the most part there is more or less smarting shortly after each stool—owing, in all probability, to small portions of fæces finding their way into the *pouches*, and there exciting irritation. The secretion of mucus within the rectum is usually increased, but pus, except in the advanced stages of the complaint, or when inflammation has supervened, is rarely noticed. Upon the whole, it may be stated that this affection is often confounded with neuralgia of the rectum, and that, not unfrequently, even after examination, the patient's complaints have been pronounced, by practitioners, *imaginary*.

TREATMENT OF ENCYSTED RECTUM.

When the surgeon has reason to believe, from the absence of inflammation, or of free discharge of mucus and pus, from the want of spasm about the sphincters, that there is no internal or occult fistula in the rectum, and no neuralgic affection, and, above all, when the *symptoms* enumerated have been strongly

* Hays's Cyclopæd. of Pract. Med. and Surg. Part vi. p. 125.

marked, especially uneasiness and pain a short time after stool, he will naturally suspect enlargement of the rectal pouches, and proceed accordingly.

The mere introduction of the finger into the rectum will not enable the surgeon to detect this disease. Dr. Physick, as already mentioned, takes a probe with about half an inch of its extremity bent back upon itself, and by moving it upwards and downwards throughout that portion of the circumference of the rectum situated between the two sphincters, is able by patience to explore successfully every part of the surface of the mucous membrane. When the dilated pouches exist, the reverted extremity of the probe drops readily into them, and each cyst may be drawn down to the verge of the anus, and distinctly seen—though not without producing severe pain to the patient. That the portion drawn down is really one of the rectal pouches may be known by its transparency, for the probe shines distinctly through it—and by the exquisite pain which the bare admission of the probe into its cavity occasions. Several of the enlarged pouches often exist simultaneously; at other times, they enlarge in succession, and months may elapse before a complete cure can be accomplished. Having drawn the cyst down by the hooked probe, Dr. Physick then cuts off the whole of it, including the orifice where the probe entered, by a pair of scissors, so that its edges retract and are soon obliterated and blended insensibly with the smooth surface of the rectum. Should other sacs exist, or form subsequently, they must be treated in a similar manner, until a radical cure is effected. In the hands of Dr. Physick, the practice has invariably proved successful, and the remark is confirmed by my own experience. So far back as 1812, I attended the late Dr. S. of Baltimore, with this complaint. It was the first case of the kind I ever saw. The nature of the disease, in this particular case, had been previously detected by Dr. Physick, and by operating in the manner he advised, I soon effected a perfect cure. I have operated subsequently, and successfully, in numerous instances. For further observations on this subject, the reader is referred to an article by Dr. R. Coates,—drawn up under the superintendence of Dr. Physick,—in the seventh number of a recent valuable publication —the American Cyclopædia of Practical Medicine and Surgery, by Dr. Hays.

SECTION VI.

STRICTURE OF THE RECTUM.

SIMPLE stricture of the rectum, like that of the œsophagus and urethra, may be either spasmodic or permanent. The former, however, is not very common, and when it does occur, is the result, probably, of disordered action of the sphincter muscles, of the levator ani, and also, not unfrequently, of the muscles of the perineum and of those surrounding the urethra. But the permanent or organic stricture of the rectum, if it be not so common as some other affections of that intestine, is, nevertheless, by no means rare. It may occupy any part of the rectum, but is commonly met with at the upper margin of the internal sphincter; and consists of a fold of the mucous membrane or coat of the gut, which in the form of a tumid ring hangs, at first, loose into the bowel, but in proportion as it acquires, from repeated straining, and irritation, firmness, projects horizontally towards the centre of the rectum, to a greater or less distance, so as to resemble in some cases a septum with a hole in its middle. Sometimes there are two or three of these folds, or ridges, within a short distance of each other, which either continue separate, or, in the course of time, approximate, and form an indurated tube which diminishes the capacity of the bowel and subverts its texture. In either case, or in that of a single ridge protruded into the caliber of the gut from its walls, the effect must be a girding, or coarctation, well calculated to interfere with the passage of the fæces, or to produce wire-drawn-like stools. Hence, all patients complain of their excrement being contracted; and this, indeed, will be found to be an almost certain accompaniment of the disease, though not infallible diagnostic, or criterion. As the stricture increases, other symptoms are developed; there is perpetual straining or nisus, sometimes followed by mucus, sometimes by blood, either from rupture of small vessels about the rectum, or from superadded

piles. The bladder, also, becomes involved, and great irritation and painful micturition ensue. Eventually, the rectum becomes extremely irritable, and so exquisitely sensitive, that the patient is often afraid to attempt the expulsion of the fæces; or, if they are passed at all, it is through the medium of purgatives, enemata, or diet, calculated to keep the contents of the bowels nearly in a fluid state. If not soon relieved, great distension of the bowels, from flatus and food, takes place, followed by more urgent symptoms, and the patient dies. Not unfrequently, he has lived for years in a miserable condition, the real nature of his case unknown to himself or his attendant, and has, finally, recovered under the management of some more skilful surgeon.

Strictures of the extremity of the rectum, or rather, coarctations of the orifice of the anus, are occasionally met with. This disease is often the result of operations, improperly performed, for hemorrhoids, prolapsus ani, fistula in ano, &c. Sometimes depositions of coagulable lymph are thrown out either on the outer or inner surfaces of the radiated folds of skin around the anus, or immediately within the termination of the rectum, where the mucous membrane and radiated folds meet. From any of these causes the opening of the anus may be so contracted as scarcely to admit the passage of a common-sized urethra bougie.

TREATMENT OF STRICTURE OF THE RECTUM.

Before attempting to overcome, by mechanical means, a stricture of the rectum, the causes of the disease should be carefully investigated, and, if possible, removed. Great attention should, in particular, be paid to the condition of the patient's stomach and bowels, through the medium of appropriate diet, gentle aperients, and enemata. Repeated ablutions of the rectum by tepid and cold water alone, or holding opium or other similar articles in solution, thrown to some distance up the gut by a well contrived syringe, will pave the way for bougies and other instruments, and sometimes, without the assistance of the latter, will effect perfect cures. But soft, well made gum elastic or waxen bougies are more to be relied upon, in the majority of

cases, than any other instruments or modes of treatment. The surgeon should take care, however, not to promise to accomplish too speedy a cure; for if, under the impression that he has nothing to do but to break down by force the barrier opposed to him, he introduce at once a large bougie and drive it home, and follow it up shortly afterwards by another still larger, he may either destroy the patient at once by tearing the bowel, or remotely by inducing peritoneal inflammation. Very instructive cases of the kind have been published by Sir Charles Bell, Mayo, and other surgeons. The utmost gentleness, therefore, should be employed during the introduction of such instruments, and caution observed in increasing their size. The more gradual the dilatation, the less will be the irritation; and whenever it is found that the patient complains much of soreness or pain, the instrument should be diminished or withdrawn for a day or two. By prudence and discreet management, radical cures may be effected in a few months: by rash and intemperate measures, the disease will be aggravated, or the patient killed in a few weeks. The bougie acts either by dilating the stricture, gradatim, or by exciting the ulcerative process, and thereby removing, through the medium of absorption, the superfluous mass of which it consists.

It has been proposed, and by high authority, to introduce a bistoury and cut through the stricture at several points of its circumference. But I am at a loss to conceive what benefit can result from such a measure. If merely divided, will not reunion take place, almost immediately, and the ridge or septum continue as firm as ever? We cannot cut out the whole of the ridge, from its base to its edge, by introducing the knife per anum, without great risk. But I have sometimes thought (should the *urgency* or *peculiarity* of the case require it,) that by laying open the muscles of the perineum, as in the lateral operation for lithotomy, and then slitting the rectum, as is too often done by ignorant or careless lithotomists, that the strictured portion of the gut might be completely extirpated. This, however, is a mere speculation, and as such must be received. The other operation—notching the stricture—has been performed, and successfully, it is said.

For coarctation of the *orifice* of the anus, the knife appears

to be the best remedy. It must be followed up, however, by the bougie; though the cure is allowed, by all familiar with the disease, to be very difficult and uncertain.

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Consult Howship on some of the most important Diseases of the Lower Intestines and Anus, p. 1, London, 1821; Observations on some of the principal Diseases of the Rectum and Anus, particularly Stricture of the Rectum, &c., by T. Copeland, p. 13, London, 1821; A Treatise on Diseases of Urethra, Vesica Urinaria, Prostate and Rectum, by Charles Bell, London, 1820, p. 311; A Practical Treatise on Hemorrhoids, Strictures of the Rectum, &c., by Calvert, London, 1824; Salmon's Practical Essay on Stricture of the Rectum, London, 1828; Two Clinical Lectures on Hernia and Strictures of the Rectum and Anus, in Lancet, London, 1827; Mayo on Injuries and Diseases of the Rectum, London, 1833; Hays's American Cyclopædia of Medicine and Surgery, Part vi. 1835.

SECTION VII.

IMPERFORATE ANUS.

This congenital imperfection is occasionally met with, both in the human subject and among inferior animals. Sometimes it is complicated with other malformations. In my cabinet there is an interesting specimen of imperforate anus, spina bifida, and club feet, all in the same subject—a child at birth. There are three or four varieties of imperforate anus—a mere closure by the common skin of the orifice of the rectum—a membranous septum occupying the same situation, or placed within the gut at a greater or less distance from its extremity—a cul de sac termination of the rectum—an entire occlussion of the sides of the rectum, or the conversion of the gut into a solid tumour. Along with these varieties, there is not unfrequently conjoined, a communication between the rectum and vagina or between the rectum and urinary bladder, so that the fæces and urine are commingled. An uncommonly fine specimen, of the latter kind, I had an opportunity of witnessing some years ago in a thorough-bred colt, the property of the late Dr. Thornton, of Washington. The animal was deficient in a tail, —its rump terminating, as in the human subject, at the os coccygis,—and the anus was completely shut up by integuments, and beneath by an apparently fleshy membrane. Along with the urine were discharged quantities of thick greenish matter, evidently of the nature of fæces. At this time the animal was a week old, sucked freely of its dam, and in other respects was perfectly healthy. Perceiving, at the natural site of the anus, a fluctuating tumour, I pushed a double-edged scalpel to the depth of an inch into the part, and immediately there was discharged about a gallon of greenish fluid, similar to that which had been accustomed to pass from the urethra. By means of plugs and tents, the orifice was kept open, by

the owner of the colt, for a few weeks; and, after that time, the use of them appeared unnecessary. The communication between the rectum and bladder closed of its own accord in a very short time. The animal, I believe, is now living and in perfect health.

This statement is made for the twofold purpose—of recording an interesting fact, and of drawing the attention of students to the diseases of domestic animals, a subject in this country very much neglected and underrated. Country practitioners are often consulted, as friends, by their neighbours and patients, concerning epidemics, or local diseases, among their stock. Instead of considering their dignity insulted by such appeals to their feelings and humanity,—as too often the case,— they should furnish cheerfully all the information they possess, or prescribe in obscure and difficult cases, according to the principles that would guide them in the treatment of a human being—for between the two, as regards mere animal conformation, there is much greater correspondence than is generally imagined, and similarity of texture is commonly associated with similarity of disease. Monro, Hunter, Jenner, Cline, and a host of other European physicians and surgeons, and the late distinguished Dr. Rush, in this country, have not thought it beneath them to investigate the disorders of those domestic creatures, upon which so large a share of our comforts, convenience and pleasure depends, nor to recommend such studies to their pupils.

TREATMENT OF IMPERFORATE ANUS.

From want of timely aid, from the nature of the disease being undiscovered or misunderstood, many infants have perished that might have been saved. It is incumbent, then, upon the practitioner to investigate, speedily, the variety of the complaint the child may labour under, and to decide, promptly, upon the treatment; for after the lapse of a few hours, meconium and other fluids may accumulate in such quantities as to produce great distension and distress, which may soon be followed by peritoneal inflammation and death. It is true,

that a few cases have been reported where recoveries have taken place, although no operation has been performed until the tenth or twelfth day. In by far the greater number of instances, however, the child will not survive beyond the fourth or fifth day.

When the anus is merely covered by a common skin, or where a membranous septum is visible, or felt, a short distance within the gut, a bistoury,—wrapped throughout the greater part of its edge,—may be pushed through the skin, or through the septum, guided, in the latter case, by a finger per anum, and the obstruction removed. But where the rectum is obliterated, to any extent, by closure of its sides, or filled up by a fleshy tumour, a more delicate and difficult operation will be demanded. Either a regular dissection in the natural course of the rectum should be made until the open portion of the bowel be reached, or a trocar of large size thrust through the obstruction. Both operations have been performed, and with success in some instances ; though in other cases they have failed—owing to the great extent of the obstruction, or the distance of it from the natural situation of the anus. Under such circumstances, it was proposed by Littre to cut through the parietes of the abdomen, either in the right or left groin, open an intestine and establish an artificial anus—by connecting the gut with sutures to the surrounding parts. The operation was afterwards performed, and with partial success, by Duret, a French naval surgeon. It has since been repeated by Pring, an English surgeon, in the case of a lady, in whom the rectum was closed by a scirrhous tumour. The operation was performed on the colon near its sigmoid flexure, and proved successful, so far as the establishment of the artificial anus was concerned, though the patient died a few months afterwards from the scirrhous affection.

If the surgeon, in any of the varieties of imperforate anus, should succeed, by the operation described, in making his way through the obstructed rectum, he will find it necessary, in order to preserve the tract or passage of suitable dimensions, to introduce plugs of lint, sponge tents, gum elastic bougies and other similar instruments, and gradually increase their size, until the requisite degree of dilatation has been effected. This, however, will be found, in many instances, the most difficult part of

the treatment; as there will be great irritation from the long-continued use of such instruments, and a perpetual tendency, in the artificial passage, to close up.

On Imperforate Anus, consult Sabatier's Médecine Operatoire, tom. iv.; Calli-sen's Systema Chirurgiæ Hodiernæ, tom. ii. edit. 1815; Ford, in Medical Facts and Observations, vol. i.; Richerand's Nosographie Chirurgicale, tom. iii.; Chamberlaine, in Memoirs of Medical Society of London, vol. v.; Wayte, in Edinburgh Medical and Surgical Journal, vol. xvii.; A. G. Hutchinson's Practical Observations in Surgery, 1826.

SECTION VIII.

FOREIGN BODIES IN THE RECTUM.

INDIGESTIBLE articles often pass from the stomach along the intestines, and are arrested by the sphincters at the anus. Pieces of gristle, of bone, of sponge, of apple-core, of toasted bread, and other similar substances, have been found within the rectum, and the cases reported. Still more numerous examples have been given of the lodgement of pins, needles, fish-bones, chicken-bones, all which have excited more or less irritation, and, in some instances, laid the foundation of fistula in ano, of extensive ulcerations, and even death. Upon other occasions foreign articles have been forced into the rectum from without either by design, or by accident, sometimes producing death, at other times most violent symptoms—as exemplified in the case of the unfortunate Edward the Second of England, murdered by a red-hot iron being thrust up the rectum, and in the celebrated case reported by Marchetti, where the but-end of a pig's tail was forced up the rectum of a courtesan, and remaining for several days, had nearly destroyed her. " Des etudians avoient projettè de jouer quelque mauvais tour a une fille publique; ils s'aviserent de lui mettre dans l'anus une queue de cochon qui étoit gelée; ils en couperent les poils un peu court, afin qu'ils fussent plus piquans et plus roides; ils la tremperent dans l'huile, et l'introduiserent par l'extrêmité la plus grosse et à force dans le fondement de cette fille, à la réserve de la longeur d'environ trois doigts qui resta à l'exteriur de l'anus : on fit diverses tentatives pour l'oter; mais comme elle ne pouvoit être tirée u'à contre poils, les soyes entroient dans les membranes du *rectum*, et causoient à cette fille des douleurs inexprimables; pour les appaiser, on fit prendre à la malade divers remédes huileux par la bouche, et on-tâcha de dilater l'anus avec un *speculum* assez pour retirer cette queue sans violence, mais on ne réussir ; il survint des accidens énormes, un vomissement

violent, une constipation opiniatre, une fièvre, très ardent, et des douleurs très vive dans tout l'abdomen."*

Although not to be classed, with strict propriety, under the head of foreign bodies, yet great irritation and even extreme distress are not unfrequently occasioned by the lodgement of ascarides within the rectum—especially in children and old people. These animals,—which probably find their way into the stomach and intestines, through the medium of fruits and unboiled vegetables, and have been found out of the body by Pallas in the waters of Siberia, and by Dr. Barry in certain springs in Ireland,—are so enveloped in mucus whilst in the rectum, which they sometimes almost choke up, as scarcely to be reached by medicine, or the most stimulating injections. That they may be gotten rid of, however, or the irritation they produce very much alleviated, by means I shall presently point out, I have had frequent opportunities of proving for the last twenty years, and on that account I notice them in this place.

REMOVAL OF FOREIGN BODIES FROM THE RECTUM.

When, from more or less irritation, difficulty of passing fæces, a peculiar pricking sensation within the rectum, whilst at stool, and at other times a discharge of purulent matter and blood, from the anus, there is reason to believe, that some foreign body occupies the gut, an accurate search should be made both by the finger and by instruments. If discovered, the extraneous article may then be removed by a pair of forceps or scoop. The latter instrument, such as is used commonly for extraction of bullets, is peculiarly adapted to the removal of hardened fæces, which often accumulate in the rectum, and become so impacted that the patient is unable to force them out. But pins, needles, fish, and chicken-bones may be removed with more facility by the forceps than any other instrument. In the extraordinary case reported by Marchetti, and detailed above, a most ingenious and successful expedient for the removal of the pig's tail, and the only one that could have been practised

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* Mémoires de l'Académie Royale de Chirurgie, tom. iii., p. 78, edit. 8vo.

with probable success was resorted to—the introduction of the
end of the tail, hanging from the rectum into a reed, the reed
carried up the gut, made to press down the bristles, that stood
like a chevaux-de-frise, and then the removal of the reed with
the tail enclosed in its cavity. " Le sixième jour on eut recours
à Marchetti : ce practicien instruit de tout ce qu'on avoit fait,
inventa un procédé fort simple, mais fort ingenieux ; il prit un
roseau creux long d'environ deux pieds, il le prépara par une
de ses extrêmités de maniere qu'il put l'introduire facilement
dans l'anus, et enfermer entierement la queue de cochon dans
ce roseau, pour la tirer ensuite sans causer de douleur ; dans ce
dessein il attacha à cette queue, par le bout qui étoit hors du
fondement, un gros fil ciré, et le passa dans le roseau ; il poussa
d'une main cette espéce de canule dans le *rectum* et il retenoit de
l'autre, le fil, pour ne pas repousser la queue en enfonçant le
roseau dans le fondement : il parvint à enfermer entierement cette
queue dans la cavitie du roseau, et délivra promptement la
malade, tant du danger de la mort que de l'état cruel où elle se
trouvoit ; elle rendit sur le champ une très grande quantité de
matieres stercorales qui avoient été retenues pendant six jours
par le corps étranger." In ancient times, when barbed arrows
were used instead of firearms, an instrument somewhat similar
to Marchetti's reed, was employed for removing them, in order
to prevent the flesh from being torn during the extraction. There
are many occasions, even now, when similar contrivances may
prove useful.

For the removal of *ascarides* from the rectum, I have em-
ployed the bullet scoop, or a small instrument resembling a
mustard spoon. I was first led to make the experiment by
finding the disease to be exceedingly common, and sometimes
productive of so much distress to the patient as to render
life almost a burden. The scoop being oiled and introduced
into the rectum, was found to bring away one or more of these
animals enveloped in its appropriate nidus, and to relieve at once
the intolerable itching so annoying to the patient. Adults can
use the instrument themselves, with the greatest facility, and are
always directed to the spot where the animal is situated, by the
itching and pricking sensation which it creates. Children will
require the assistance of a physician or skilful nurse. Incredible
quantities of these troublesome insects may be taken away in a

short time, by this simple expedient—where medicines might be
employed for months, and at last fail.

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Consult Memoires de l'Academie Chirurgie, tom. iii.; Prècis Observations sur
les Corps Etranger, &c., par M. Hevin; Dictionnaire des Sciences Medicales, tom.
vii. p. 35 ; On Painful Constipation from Indurated Fæces, in Lond. Med. Obs.
and Inq. vol. iv. p. 123 ; Case of a Fork thrust up the Anus, and extracted, in
Philosophical Transactions, abridged, 1725 ; Harrison's Case of Apple Core, form-
ing a Fistula in Ano eight months after being eaten, Memoirs of Medical Society
of London, 1796 ; Blair's Case of Hard Toast arrested in the Anus, in Medical
Facts and Observations, vol. vi.; Gregory's Case in which Death followed from a
Fish-bone lodged for years in the Rectum, in Monro's Morbid Anatomy of Stomach
and Gullet, p. 22, Ed. 1811.

SECTION IX.

FISSURE OF THE ANUS.

THE attention of the profession has been called to this disease only within the last few years. In this country it is still comparatively a rare affection; for although connected, for the last twenty years, with the largest hospital in America, and accustomed to attend during the winter months, when the patients are most numerous, I have seen very few cases which could be said to correspond in symptoms with the details furnished by writers, and therefore feel justified in asserting that the disease with us is seldom met with.

By the term fissure is understood a superficial ulceration which occupies, in the form of a sulcus or irregular groove, the mucous membrane and radiated folds of fine skin that are fused into each other near the verge of the anus. It is not easy, always, to determine the extent of the furrow without the assistance of a speculum, or the introduction of a finger into the rectum. Generally, it is at least half an inch in length, but seldom penetrates through the substance of the mucous membrane. It commonly occupies the back and sides of the anus, is rough, irregular, and reddish on the bottom, when spread open, and its projecting margins indurated, protuberant, or serrated. The pain accompanying it is of a peculiar burning, lancinating kind, which gradually increases for hours after a stool, and at last becomes almost intolerable—from the spasmodic action of the sphincters and lodgment of acrid fæcal matter. The disease may be traced in some instances to the mechanical distension of the rectum by hardened fæces, in others to piles, and to the too frequent and unskilful use of glyster pipes. According to Dupuytren, there are three varieties of fissure—above, below, and on a level with the sphincter. The last are the most painful and difficult of cure. Those above the sphincter feel like a hard cord, and those below are attended with pruritus

rather than with pain.   Each form of the disease is liable to
be mistaken for affections of the urinary bladder—from the
irritation communicated from the rectum to that organ.

TREATMENT OF FISSURE OF THE ANUS.

Under the impression that spasmodic action of the sphincter
muscles was the cause of fissure of the anus, Dupuytren ad-
vised, in most cases of the kind, the introduction of rectum
bougies, covered with an ointment composed of hogs' lard, bella-
donna, and acetate of lead; and states, that in a few days, the
symptoms were so mitigated generally as to supersede the neces-
sity of other applications.   In other instances, however, he
concurred with other surgeons, that nothing less than the knife
or caustic would answer the purpose of effecting a cure.   In
general, the lunar caustic should be tried for two or three weeks
—after more simple remedies, such as opiate and mercurial
lotions, have failed—and if repeated applications of it—aided by
a common speculum, that of Weiss, or still better by an ingenious
contrivance of the kind lately invented by Dr. Pitney, of Auburn
—do not cause the fissure to granulate and fill up from the
bottom, then the furrow along with the sphincter and gut, may
be divided by the probe-pointed bistoury, as in fissula in ano,
and a cure is almost sure to follow.   I have seldom failed,
however, with the caustic; and in an obstinate case, lately at-
tended by Dr. Horner and myself, in a gentleman from Louisiana,
after three weeks' use of the caustic, followed up by ratanhy
injections, the patient returned home perfectly restored, and
entirely rid of symptoms which rendered his life almost insup-
portable.

CHAPTER VII.

DISEASES OF THE TUNICA VAGINALIS AND TESTIS.

HAVING treated on a former occasion* of cancer and of fungus hæmatodes of the testicle, and described the treatment and operations necessary for each, some other affections of these organs will be noticed. These are hydrocele, hæmatocele, chronic enlargement of the testis, irritable testis, encysted testicle, tumours of the scrotum, &c. Among surgical writers, accounts will be met with, of the œdematous hydrocele or dropsy of the scrotum, of hydrenterocele or hydrocele combined with intestinal hernia, of encysted hydrocele of the spermatic cord, of the congenital hydrocele. These, however, are either the result of other diseases, or are so analogous, in many respects, to common hydrocele, as not to require minute consideration.

SECTION I.

HYDROCELE.

THE tunica vaginalis is naturally bedewed with a thin serum, which, by lubricating its surface and that of the testicles, enables them to move freely upon each other. This fluid, when secreted in undue quantity, constitutes hydrocele—a disease of frequent occurrence, and met with in patients of every age and constitution. If attended to in the commencement, the tumour will will be found to occupy the lower part of the scrotum, and gradually to extend towards the abdominal ring. In shape it is

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* Vol. i. pages 200 and 206.

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pyriform, and to the touch elastic—feeling like a bladder distended with water. When pressed upon, little or no pain is experienced by the patient, except at the posterior part of the swelling where the testis is situated. The rugæ of the scrotum generally remain unaltered, even in hydroceles of the greatest magnitude, and sometimes the tumour attains an enormous bulk. In ordinary cases, however, the tunica vaginalis seldom contains more than a pint of fluid. This fluid, in colour, is either perfectly limpid, or else yellowish. The disease is usually confined to one side. It is sometimes difficult to distinguish between hydrocele and other complaints that bear a resemblance to it. Much may be learned from the history of the disease. The hydrocele invariably begins below, and very gradually ascends. The swelling in sarcocele, or scirrhous testicle, is uniform throughout, is accompanied with pain, is inelastic, and heavier when handled than hydrocele. When recent, hydrocele is generally transparent, if examined by placing the tumour between a lamp and the surgeon. From hernia it differs materially—the one commencing above, the other below. In hernia, moreover, an impulse is communicated to the finger when the patient is directed to cough. This is not the case with hydrocele. The causes of hydrocele are very uncertain. By some the disease is attributed to urethral excitement, by others to varicose enlargement of the spermatic vessels, to blows upon the scrotum, to rheumatism, cold, &c. I have met with it in infants immediately after birth. Hydrocele is often conjoined with enlargement of the testicle—constituting the disease called *hydro-sarcocele.*

It occasionally happens that the cavity of the tunica vaginalis is occupied by one or more hydatids, or cysts filled with transparent fluid ; and that the tumour bears so close a resemblance to common hydrocele as to be mistaken for it readily. A few cases of the kind I have met with, both in young and old subjects. Sometimes the two diseases exist simultaneously, and occupy the same tunica vaginalis. In other instances the hydatids are connected with the epididymis, or substance of the testicle, and protrude when the tunica vaginalis is opened by a trocar or lancet.

Hydrocele of the *spermatic cord* is now and then met with. It usually appears as a rounded or oval tumour, in the site of

the external abdominal ring; or it may be situated in the abdominal canal, between the internal and external rings. It is elastic to the touch, and retires in such a way, from the finger, as to give the idea of the existence of hernia, with which it is often confounded, even by experienced surgeons. A man forty years of age, in the Philadelphia Hospital, during the winter of 1833, had a tumour the size and shape of an egg, which occupied the left cord below the external ring. It was pronounced by some a hernia, by others, a varicocele. I was satisfied, however, by its not retiring with a gurgling noise, by its being free from pain, and by its transparency and bluish colour, that it was a hydrocele of the cord; and so it turned out to be; for upon thrusting a lancet into it, nearly an ounce of limpid serum was discharged.

Under the title of *congenital* hydrocele, a variety of that disease was first described by Vigurie and Desault, and was ascertained by them to be owing to the communication being kept up between the abdomen and tunica vaginalis, so that water accumulating in either of those cavities, might pass freely from one to the other. This form of the complaint is by no means uncommon; but is not confined to children. Hence, the term congenital is not strictly correct. It may be distinguished from common hydrocele by the fluid retiring into the abdomen when the patient is in the recumbent posture, and by its reappearing with more or less fluctuation in the erect position. The complaint is sometimes complicated with hernia.

TREATMENT OF HYDROCELE.

In very young subjects, and in recent cases, I have sometimes succeeded in removing the disease by purgatives, and by bathing the tumour repeatedly with a mixture of sal ammoniac and vinegar. Sir Astley Cooper recommends, in similar cases, a suspensory bandage moistened with muriate of ammonia and liquor ammoniæ acetatis, two drachms of the former to six ounces of the latter; and, after using it for awhile, to add to the mixture tinctura lyttæ, or to apply tincture of iodine, in case the fluid is not absorbed. In the majority of instances, however, an operation will be required. This is either *palliative* or *radical*. The former

may prove necessary when there is any doubt respecting the
nature of the disease, or it may be performed to diminish the
size of the swelling, and thereby enable a patient to pursue a
journey without interruption. In a short time the fluid accumu-
lates again ; and, if necessary, the operation may be repeated.
A common lancet, or a small trocar, answers equally well for
the operation.

The *radical* cure of hydrocele has been attempted in various
ways—by *laying open* the tunica vaginalis, by passing a *seton*
through it, by applying *caustic* to the surface of the tumour, by
extirpating a part of the tunica vaginalis, by the introduction of
a *tent*, and by the *injection* of the cavity of the sac, after having
drawn off its contents. The latter operation is the one prac-
tised by most modern surgeons, and when properly performed,
is generally successful.

The patient being seated on the edge of a bed, or table, with
his thighs separated, the operator sits before him, and grasps the
tumour so firmly with one hand as to render it perfectly tense,
while with the other he introduces a trocar of moderate size,
covered by its cannula, obliquely upwards and inwards, into the
front of the tumour, near its lower part.* The trocar, thus held,
is made to penetrate the integuments of the scrotum, and the
tunica vaginalis, to the depth of an inch and a half, and is then
withdrawn, leaving the cannula behind, through which the fluid
is immediately discharged. The nozzle of a syringe, or gum
elastic bag, is next adapted to the mouth of the cannula, and an
injection, consisting of two parts of port wine, and one of water,
thrown into the tunica vaginalis until it is distended to the size
of the original tumour. The length of time the injection should
be permitted to remain, must depend upon the patient's feelings.
In general, a pain will be felt along the cord, extending into the
abdomen ; and when this becomes very severe, the wine and
water must be evacuated ; on the contrary, if the patient, as
I have sometimes noticed, should experience no pain whatever,

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* The opening is made in this situation, and the instrument directed *obliquely*
with the view of avoiding the testicle, which is usually situated *posteriorly*. But
it should be remembered that the testicle is sometimes placed in front, and will,
therefore, be wounded if the above direction is followed. To avoid so unpleasant a
consequence, the operator must endeavour beforehand to ascertain, if possible, its
exact position.

the injection may be renewed, and its strength increased. It only remains to withdraw the cannula, and close the wound by a bit of lint. In a few hours the parts swell, sometimes enormously, and may require the application of a poultice, the antiphlogistic system, and the recumbent posture. But the swelling usually subsides in four or five days, and a cure is accomplished through the medium of adhesion—the tunica vaginalis being made to coalesce with the proper coat of the testicle. Various other injections are used by surgeons, but they have no advantages generally over the port wine and water.

This operation, trifling as it is usually considered, is sometimes, from inattention on the part of the surgeon, followed by serious consequences, owing to the end of the cannula being permitted to slip from the cavity of the tunica vaginalis, and rest among the cellular membrane of the scrotum, into which the vinous injection will pass, and, by exciting most violent inflammation, cause gangrene and sloughing of the scrotum, and denudation of the testicles. This has repeatedly happened to surgeons of the first eminence, and should be most carefully guarded against. Sir Astley Cooper mentions an instance in which a patient, from this cause, died in about a week after the operation, and I myself have known of one case of the kind, and heard of another in this country.

If the operation of hydrocele, above described, should fail, as sometimes happens, it may be repeated; or the plan of Hunter may be pursued—which is simply to make an incision an inch long, into the upper and front part of the tunica vaginalis, evacuate the water, and sprinkle a little flour into the cavity. This generally excites the requisite degree of inflammation; and, after this purpose is accomplished, the flour may be washed out, or permitted to escape along with the pus.

This operation, however, is followed, sometimes, by violent inflammation, and, in old people, by gangrene and death. In other cases the suppuration is so profuse that the tunica vaginalis is filled with matter. But I have known the same to follow, in one instance, the operation by injection. I performed, November 22d, 1835, the operation for hydrocele on a negro fifty years of age, at the Philadelphia Hospital. Nearly three pints of fluid were drawn off and the vinous injection thrown in. The wound made by the trocar healed up, but the swelling

did not subside, and the patient's constitution was rapidly sink-
ing. On the 22d of December, I pushed a lancet into it, and
evacuated nearly a quart of thick offensive pus, and in a short
time the man recovered perfectly.

I have had occasion to repeat the operation by injecting two
or three times in different individuals, and, at last, only have
succeeded by using spirits of wine, or turpentine, along with
the port wine; and although no injurious consequences followed,
yet I am not inclined to recommend the practice, but have pre-
ferred, latterly, where the injection has failed, not to repeat it,
but to resort to the *seton*, of which, under all circumstances, I
entertain a very favourable opinion. The plan I pursue is very
simple. The water being drawn off, in the usual way, by a
trocar, I permit the cannula to remain, and pass through its
cavity a small narrow seton needle, six inches long, armed with
French braid, and, pushing the needle through the tunica vagi-
nalis and scrotum, introduce the braid, and remove the cannula
and needle—leaving a space of two or three inches between
the orifices where the ends of the braid emerge, and tie the ends
loosely together. Perfect cures having invariably resulted from
this practice, in my hands, I have resolved, in future, where I
have reason to believe that the requisite degree of inflammation
will not be excited by the injection, to employ the seton at once,
and from the first. Indeed, I see no good reason why it should
not supersede the injection in all cases; for in the hands of the
celebrated Pott, and others, it scarcely ever failed; and was
never followed, so far as I am acquainted, with serious conse-
quences. In general, it will be sufficient to permit the seton to
remain ten days, or a fortnight, and during that time no attempt
should be made to draw it backwards and forwards, which
would only create unnecessary pain and inflammation.

The largest hydrocele I have ever seen in this country, was
in the Philadelphia Hospital during the winter of 1840. The
subject of it was a large powerful man, forty years of age,
who had been injured eight years before, by a blow on the
breast and back, from the tilting hammer of a forge. He had
laboured, previously, under common scrotal hernia of the right
side, and congenital hernia of the left. On the right side, the
scrotum began to enlarge soon after the accident, and continued
to increase until I saw him, when the tumour, which was pyri-

form and elastic to the touch, and evidently contained at the upper portion a reducible hernia, reached nearly to the patient's knees. I performed the operation before the clinical class, and drew off more than three quarts of yellowish brown fluid, and then passed the long gun shot probe armed with a tape, through the tunica vaginalis—leaving a space of six inches between the orifices. The walls of the tunica vaginalis were nearly an inch thick in some places, and half an inch in others. Volumes of intestine came down immediately after the fluid was drawn off, and caused the tumour to be as large as ever. These were reduced, however, and kept up by a bandage. Profuse suppuration followed in two or three days, large lumps of cheese-like matter came away from the opening, along with extremely offensive pus, and under these debilitating discharges, the patient was obliged to be sustained for weeks, by brandy, ammonia, and nutritious diet. Creosote, and other astringent injections, were employed to correct the fœtor and diminish the discharge, and the patient finally recovered after the lapse of two or three months—the hernia on each side being diminished and kept up by the tumour, which served as a truss and was solidified and contracted to the size of a cocoa-nut.

Of the other methods of treating hydrocele—excision, caustic, and the tent, I do not speak, because they are acknowledged, by all modern surgeons, to be either very severe or else inert.

Where *hydatids* occupy the tunica vaginalis, and fill it entirely, (a disease which cannot be distinguished, always, previous to operation, from common hydrocele,) the surgeon will discover that a very little fluid follows the push of the trocar, and that a membranous bag will protrude immediately afterwards from the opening. In such a case, he will find it necessary to enlarge the orifice an inch or two, and dissect away with the knife, or scissors, the different hydatids he may meet with. The operation is tedious, and painful, but generally successful.

In cases, however, where ordinary hydrocele is associated with two or three floating hydatids, the water must first be drawn off, and the injection, or seton, introduced, and each hydatid afterwards pulled out as it shows itself, (which it generally does,) at the orifice, and cut off. Should any smaller hydatids remain, the inflammation that follows the injection or seton, will commonly obliterate them. If not, a small separate seton should,

afterwards, be passed through them, and suffered to remain for a few weeks.

For *hydrocele* of the *spermatic cord*, either incision, or injection has been usually employed. The former is painful and apt to be followed by suppuration, and the latter almost sure to fail, even when repeated frequently. The seton is uniformly successful, and is decidedly, in every respect, the best remedy. Pott and other surgeons have reported cases where death has followed from laying open hydrocele of the cord.

Congenital hydrocele as improperly termed, may be cured, sometimes, by a well contrived truss, which, by obliterating through the medium of adhesion the sides of the tunica vaginalis, shuts off the communication with the abdomen. Viguirie and Sir Astley Cooper report successful cases of the kind; but Desault, having tried the plan ineffectually, was induced to substitute another proceeding, more complicated, painful, and fraught, I conceive, with considerable danger. He first drew off the water by a trocar, then directing an assistant to make firm pressure at the groin, injected the tunica vaginalis with warm wine, and having afterwards carefully removed every particle of wine, lest it should find its way into the abdomen, by firm compresses over the scrotum and groin, succeeded, in a short time, in obliterating the passage to the abdomen and in curing, at the same time, a hernia which happened to be conjoined with the hydrocele. This example, however, should not, I conceive, be imitated, on account of the risk of peritoneal inflammation from continuity of surfaces, and from the possibility of escape of the vinous fluid into the abdomen. Should a truss effect a cure, by producing an hourglass-like contraction between the belly and tunica vaginalis, it may afterwards become necessary to draw off the fluid from the latter by a trocar and perform some one of the operations for ordinary hydrocele. But experience proves that the fluid is sometimes spontaneously absorbed after the communication between the two cavities has been cut off. In cases where ascites and hydrocele are conjoined, the scrotum will be found a convenient place for the operation of paracentesis.

Hydrocele is removed, occasionally, by a blow upon the tumour, and, in other instances, by ulceration, or sloughing,

from slow inflammation, or over-distension. I once performed the palliative operation upon a gentleman, and after the lapse of a few weeks, when the fluid accumulated again, ulceration took place at the spot pierced by the trocar, and left for a few days a fistulous orifice, from which the fluid drained off. In a few days the fistula closed and the fluid was again secreted, and again discharged, in a similar way; and after the process had been repeated several times, a cure was effected. Something similar occurred in a patient upon whom I operated for stone; for in twelve months after the operation the perineum ulcerated at the place of incision, and a lump of calculous matter was discharged from the bladder along with urine. The ulcer then healed up of its own accord, and the patient never had a return of his complaint.

SECTION II.

HÆMATOCELE.

This disease, as its name implies, is a collection of blood—situated either in the tunica vaginalis testis, within the tunica albuginea, or in the cellular membrane of the scrotum. It may arise, according to writers, from several different causes—from wounding one or more of the large veins of the scrotum in performing the operation for hydrocele,—from wounds of the vessels of the scrotum, during the operation of lithotomy and castration,—from rupture of branches of the spermatic vein,—from spontaneous rupture of a vessel within the tunica vaginalis, after the water of hydrocele has been drawn off,—from blows or injuries of the vessels of the testis, and consequent extravasation of blood within the tunica albuginea.

The disease may be distinguished, generally, from hydrocele, by its great weight and solid feel, and by its want of fluctuation and transparency, by its often following the operation of hydrocele, or by its arising suddenly from a blow, and sometimes, by the appearance of extravasated blood in the cellular membrane of the scrotum.

TREATMENT OF HÆMATOCELE.

Unless the extravasation of blood should be very considerable, it will probably be absorbed in a short time. If, in this respect, however, the surgeon is disappointed, an incision may be made into the part that contains it, and the coagulum extracted; after which, the parts will granulate and fill up. If any particular vessel continue to pour out fresh blood, it must be searched for and secured by ligature. During the winter of 1830, I attended a patient in the Philadelphia Hospital, whose scrotum was distended to an enormous size. Upon opening the tumour, I found a large collection of blood mixed with serum. Three weeks

previously, the patient had undergone the operation for hydrocele, and the surgeon who performed the operation had, in all probability, wounded with the trocar some large artery or vein. The man recovered perfectly in a short time. Effusion of blood under the tunica albuginea, is considered by Pott, and some other writers, as requiring castration; but, as I conceive, without foundation.

There is, indeed, more reason to apprehend that the surgeon may be too prompt in performing this operation; for cases have been reported where the testicle has been extirpated and found upon examination perfectly sound. Sir A. Cooper, in particular, mentions an instance where a surgeon mistook a common hæmatocele for diseased testis, and had so little curiosity, after castrating the patient, as not to examine the part. When dissected by Sir Astley, blood only was found in the tunica vaginalis, and the testicle in its natural situation and free from disease.

On Hydrocele and Hæmatocele, consult Pott's Works, by Earle, vol. iii.; A Treatise on Hydrocele, by Sir James Earle, 1803; Bell's Operative Surgery, vol. i. p. 193; Ramsden's Practical Observations on Sclerocele, 1811; Dorsey's Surgery, vol. ii.; Richerand's Nosographic Chirurgicale, tom. iv. p. 262 and 258; Scarpa on Hernia, by Wishart; Observations on the Structure and Diseases of the Testis, by Sir Astley Cooper, 4to., London, 1830.

SECTION III.

ORCHITIS.

THE usual form of this disease, which is an acute inflamma-
tion of the testicle, has been noticed already* under the common,
but unmeaning, appellation of hernia humoralis. A few addi-
tional remarks upon it, however, in this place, seem to be re-
quired. Whether arising from gonorrhœa, or from blows or
wounds of the testis, or from other causes, the symptoms do not
appear to vary materially. Sir Astley Cooper, however, has
remarked, that when acute inflammation of the testicle arises
from sympathy with the urethra, it rarely proceeds to suppura-
tion. On the other hand, it has been observed by the same high
authority, that "a wound of the testis does not produce the pain
and inflammatory effects which might be anticipated;" that he
had several times known a lancet and even a trocar thrust into
its substance, which was followed by a sickening pain, and by
vomiting, but the wound healed readily and without suppuration;
that in one instance, however, he had known the trocar twice
thrust into a testis, and to be succeeded by violent inflammation
and suppuration. If then from gonorrhœa, from irritation of
the urethra, prostate or bladder, by bougies or catheters, from
cold, injuries, cynanche parotidea, or other causes, acute inflam-
mation should arise, the following symptoms will display them-
selves in greater or less time. At first there is irritation about
the neck of the bladder and spermatic cord, which is soon fol-
lowed by pain and swelling of the epididymis, then by diffused
general enlargement of the testicle, with an acutely painful
dragging sensation upon the cord, and such exquisite tenderness
of the body of the testis—as if the part were forcibly squeezed
in a vice—as to cause the patient most intense and agonizing
suffering. After this the pain shoots into the abdomen, along
the cord, and diffuses itself from the centre to the circumference,
affecting the groin, hip, and loins, and inside of the thigh, in-

* See vol. i. p. 217.

volving, from intercommunication of the trunks and branches of
nerves, all the parts in the neighbourhood of the pelvis and
thighs.   Under such local suffering, the constitution is not likely
to remain long passive.   The pulse becomes quick, hard, and
full, the tongue furred, the skin hot and dry, and the bowels
constipated.   These symptoms are often followed by rigors,
and by the establishment of the suppurative process within the
body of the testicle.   At last the tunica albuginea ulcerates,
and the matter is discharged through one or more openings,
which are apt to become fistulous and sometimes to throw out a
fungus.   Care must be taken, however, not to confound this
excess of granulation with protrusion of the tubuli seminiferi, a
consequence of injuries of the testis long ago pointed out by
Petit, and afterwards noticed by Lawrence.   Several cases of
the kind I myself have seen, and one in particular I attended
many years ago with Dr. Hartshorne, to which case we were
both called in consequence of an opening having been made, im-
properly, by a physician into a testicle, and the tubuli seminiferi
squeezed out, under the impression of there being purulent matter.
In consequence of orchitis, from any cause, it not unfrequently
happens, that *atrophia* of one or both testicles ensues—nothing
but a small pea-like excrescence, or remnant of the testicle,
being left.

TREATMENT OF ORCHITIS.

The remedies for orchitis are constitutional and local.   Unless
the inflammation, however, runs very high, general blood-letting
will not be required, but the recumbent posture, and at the same
time elevation and support of the testicles by a well contrived
suspensory bandage, leeches, cold applications of the acetate of
lead, of the muriate of ammonia, conjoined with the internal
use of saline purgatives, nauseating emetics, and other similar
means, will generally effect a cure in a short time.   With some
irritable patients, however, a long-continued course of depletion,
if it does not prove injurious, is not beneficial.   The same may
be said of cold saturnine lotions.   In such cases the submuriate
of mercury combined with compound powder of ipecacuanha,
administered internally, and warm applications to the part, will

prove, according to Sir Astley Cooper, the most efficient reme-
dies.   A long time often elapses before the swelling and hard-
ness of the testicle subside, even after the pain and other urgent
symptoms have been entirely removed.   Under these circum-
stances, oatmeal and vinegar poultices, mercurial frictions and
plasters, ointments of the hydriodate of potash and iodine should
be employed, and along with them, internally, the liquor potassæ
and compound extract of colocy th.   But the best local treat-
ment, perhaps, of all others is that extolled by Ricord—*compres-
sion* by adhesive straps.   I myself have not tried the plan to
any extent, but from a communication recently made to me by
a very intelligent and accomplished young surgeon, Dr. J. F.
May, of Washington, I am inclined to believe that it has not yet
met with that attention it deserves.   " I will only say," Dr. May
remarks, " that the method of treating orchitis by compression
with adhesive straps, so vaunted by Ricord, I have found to be
by far the most successful I have ever tried.   I have treated a
number of cases both in the Baltimore Infirmary and in private
practice in this city in this way, and have invariably found that
the swelling was much sooner removed and induration much less
liable to remain than by all the other means that have been record-
ed put together.   If properly applied, I find they give relief even
in the acute stage of the disease."   If pus is actually found under
the tunica vaginalis, the sooner it is let out the better, to prevent
it from being diffused, and from disorganizing the testicle.   Should
a fungus sprout from the opening, it may be repeatedly sliced
off or repressed by caustic, but no attempt should be made to
force out what may be supposed pus, but which, in reality, will
generally prove to be the tubuli seminiferi.   Many patients
entertain, and are alarmed at, the idea of losing the function of
the testicle, in consequence of enlargement of the gland, after
acute orchitis.   From dissections, however, made by Sir Astley
Cooper, Sir Benjamin Brodie, and others, it appears that the
parts are generally found in a healthy state, so far as the con-
veyance of the semen by the vasa efferentia and coni vascu-
losi to the epididymis is concerned, and that the increased
swelling generally depends upon effusion of lymph into the
interstices of the glandular structure, and does not injure the
functions of the testicle.   For *atrophia* of the testicle, unfortu-
nately, there is seldom any relief.

SECTION IV.

IRRITABLE TESTIS.

This disease has been particularly described by Sir Astley Cooper under the title of irritable testis. It is a most severe and distressing affection, but, fortunately not very common. Sometimes it follows hernia humoralis, or common inflammation of the testicle induced by injuries, though not, perhaps, until the inflammatory symptoms have disappeared for months; at other times it comes on without evident cause, and may occur in persons of vigorous and healthy constitution. But, on the other hand, it is occasionally preceded or followed by paralysis, or derives its origin from the brain or stomach. That one or more of the nerves of the spermatic cord may be materially implicated in this affection is not improbable. The symptoms are excessive pain in coitu, pain in the groin and back, exquisite tenderness in the whole testicle, particularly upon the slightest motion of the testicle, or any pressure that may be made upon it by the clothes in walking. There is scarcely any general swelling, or enlargement of the testicle, nor is the uneasiness or pain diffused throughout the gland. On the contrary, there is sometimes diminution of the testis, and the pain occupies a single spot or point, and may shift from one part to the other in an instant. The cord is frequently the seat of suffering, and from it to the testicle the pain darts barkwards and forwards, like a flash of lightning. The recumbent posture on the side opposite the disease, is the only one the patient can generally bear. Nausea, vomiting, mental dejection, and extreme bodily distress, are apt to follow long-continued attacks of the disease, and in some instances months and years wear away without any perceptible amendment or alleviation of the sufferings. When removed and examined by dissection, the testicle is found unaltered in structure, and apparently sound. In other cases, it is entirely absorbed with the exception of the tunica albuginea and

tunica vaginalis. This *atrophy*, however, I have known to follow other affections of the testis, particularly hernia humoralis, and that enlargement of the gland produced by cynanche parotidea, or mumps. In all the cases of the kind I have met with, one testis, or both, has wasted away, gradually, the pain has subsided, and the patient recovered.

TREATMENT OF IRRITABLE TESTIS.

If the disease should reach the height I have described, it can seldom be removed except by the operation of castration. When only of a few weeks' duration, and the symptoms are moderate, benefit may be obtained, and a cure sometimes effected, by the internal use of carbonate of iron, arsenic, ammonia, quinine, camphor, opium, cicuta, stramonium, belladonna, compound decoction of sarsaparilla, and by the local application of blisters to the groin, and thigh, and tincture of iodine, and pyroligneous acid, ice, &c., to the scrotum. Blood-letting, low diet, purgatives, and other parts of the antiphlogistic system, generally aggravate the complaint. Four years ago I was induced, in an obstinate case of irritable testis, to cut down upon the spermatic cord and divide its *nerves*, leaving the cremaster muscle and vas deferens untouched. The operation proved very difficult, but eventually produced so much relief, that the patient does not regret having submitted to it.

SECTION V.

CHRONIC ENLARGEMENT OF THE TESTIS.

From inordinate indulgence in venery, or masturbation, from any urethral excitement, from exposure to cold, from fatigue or mental inquietude, from intemperance, and from various constitutional causes, chronic inflammation is set up in one or both testicles, and is so insidious in its approach and so gradual in its advances, as often to escape the notice of the patient, and to deceive the surgeon. In particular, even after the disease has existed for weeks or months, the testicle may be handled roughly without exciting pain or any unpleasant sensation. Indeed, in many instances, the testicle attains a considerable magnitude, and yet is entirely devoid of uneasiness. The swelling commences in the epididymis, which slowly hardens and enlarges. From the epididymis it extends to the body of the gland, and both preserve their natural smoothness and shape.

Both testes may be simultaneously effected, or the swelling may remain stationary in one and increase in the other. With the swelling a hydrocele is often conjoined. The patient's general health is apparently good, and he is seldom debarred from exercise or prevented from attending to his business. In this state of the disease, it often happens that a blow, or some other injury is received, or that the patient has been drinking to excess, or exposed to cold, and from that moment great pain and swelling take place in the testicle, which are soon followed by pain in the loins, and febrile excitement. By the use of appropriate remedies these symptoms wholly subside, and for weeks, or months, the patient remains, apparently, well. He is very liable, however, to a repetition of the attack, and should this occur frequently, suppuration is established in the body of the testicle or epididymis, and the matter of its own accord, at last discharged through the scrotum, or let out by the surgeon.

A sinus ending in a fistulous orifice, soon follows, and from this a discharge of seminal fluid issues, sometimes in considerable

quantity, and is kept up, not unfrequently, for many months. From the mouth of the sinus, granulations in a fungous form, sprout forth, and often become very luxuriant. Indeed, in this, and other respects, there is reason to believe that chronic enlargement of the testicle corresponds with *fungus* of that organ, described in former editions of this work.

TREATMENT OF CHRONIC ENLARGEMENT OF THE TESTIS.

In the commencement of this disease, or even after considerable swelling of the testicle has taken place, strict confinement for several weeks, to the horizontal position, elevation of the testicle above the pubes, and retention there by a bag truss, the application of leeches, followed up by cold saturnine solutions, or camphorated mixture, and vinegar, or the acetated liquor of ammonia, together with low diet, occasional purgatives, the internal use of mercury, and avoidance of venereal excitement or indulgence, will often effect a perfect cure. But should the patient afterwards neglect himself, and have repeated returns of the complaint, and suppuration of the testis, discharge of semen through fistulæ, and fungous granulations follow, extirpation of the testicle will in many cases be required, and, indeed, will often be insisted on by the patient. In other cases the fungous granulations may be repressed by caustic, or should be cut away with the knife, or kept down by pressure, whilst injections of solution of sulphate of copper and other similar articles are thrown into the sinuses, to consolidate their sides and close the fistulæ. It should be remarked, however, that the operation of castration has often been performed unnecessarily for chronic enlargement of the testis, under the idea of its being a specific or malignant disease, which in reality, it is not, as is proved by the circumstance of the cord not being liable to contamination, as it always is in the advanced stages of cancer of the testicle.

SECTION VI.

ENCYSTED TESTICLE.

CYSTS, containing a yellow, transparent serum, or else a turbid gelatinous fluid, are found to occupy, occasionally, the substance of the testicle within the tunica albuginea. They vary in size, some being not larger than a shot, and others equal in bulk to a pistol-bullet. The fluid contained in the larger ones is thick and muddy, and in the smaller transparent. Both the tunica vaginalis and albuginea are thickened, and in cases of long standing, the substance of the testicle in a great measure removed, and its place occupied by the cysts. According to Sir Astley Cooper, these cysts are probably enlargements of the seminiferous tubes, and not animal hydatids.

Patients from eighteen to thirty-five years of age are most subject to the complaint, which, however, is rather uncommon than otherwise, and very liable to be confounded with other affections of the testicle, particularly with hydrocele. But the most striking symptoms of hydatid testicle are—conspicuous distension of the veins of the scrotum and spermatic cord, no tenderness, or pain, in the commencement of the disease, or even in the advanced stages, unless the part be forcibly squeezed; and then sickness of the stomach, pain in the groin, and that peculiar sensation which follows pressure on a sound testicle, arise. The testicle, too, retains its natural, or rounded shape, is heavier than usual, has a very obscure and limited sense of fluctuation, and the epididymis preserves, generally, its natural line of demarcation. In the end the tumour becomes enormously large, but the cord and inguinal glands are never contaminated. Lastly, there is no transparency in the tumour. This, together with absence of distinct fluctuation, and the rounded, instead of pyriform shape of the swelling will be sufficient, in most cases, to distinguish the disease from hydrocele. Nevertheless, the

most experienced surgeons have been frequently deceived, and
have confounded one with the other.

TREATMENT OF ENCYSTED TESTICLE.

Before giving a decided opinion, the surgeon should make it
a rule to puncture with a lancet every tumour bearing a resem-
blance to encysted testicle.   In case a few drops of fluid issue
mixed with blood, the nature of the disease will, generally, be
made manifest. It will then become a question whether cas-
tration should be performed or not.   When the tumour is im-
mensely large and inconvenient, or so unsightly as to annoy
the patient, it may be removed; but, on the contrary, when it
remains stationary for years, and the patient's mind is not filled
with apprehension as to the termination of the case, he should
be advised to submit with Christian resignation to his misfortune
and to palliate the complaint as long as possible.   On the other
hand, should he determine, after mature deliberation, to lose
the testicle, the surgeon has it in his power to assure him of the
safety of the operation, and that the disease—which is not of a
malignant nature,—will not return.   It may happen, however,
to be conjoined with fungus hæmatodes, and in that case an
operation will prove fruitless.

SECTION VII.

TUMOURS OF THE SCROTUM.

SARCOMATOUS, and other indurated growths are met with, occasionally, in the cellular texture of the scrotum, which sometimes are scattered about in the form of small tumours, and feel like a marble or piece of cartilage beneath the skin, being either firmly fixed or moveable; at other times the whole texture of the scrotum seems to undergo a change, becomes unusually corrugated, thickened, and finally converted into enormous indurated masses. Such are often seen in the West Indies and in Egypt, and interesting cases of the kind have been reported by Larrey, Titley and others, but are rarely met with in the United States. When a single sarcomatous, or adipose tumour occupies the scrotum, or the outer surface of the tunica vaginalis, or is imbedded in either of these textures, it often presents the appearance of a third testicle, and has so been considered by ignorant persons. An interesting case of the kind occurred several years ago in the practice of Dr. Heister, an eminent physician of Reading in this State. The tumour had existed for a long time, was of the shape of a testicle, but much larger, and was so situated between the testes as to inspire a belief on the part of the patient and his friends that it was really a third testis. Upon being removed, however, by Dr. Heister, it was found to be lodged in a cyst between the scrotum and tunica vaginalis, and to consist of adipose and fleshy matter. The preparation, obligingly presented to me by Dr. Heister, is still in my cabinet.

TREATMENT OF TUMOURS OF THE SCROTUM.

Those enormous growths described by Larrey, Hendy, Titley, Delonnes, although supposed to derive their origin from an incurable disease—elephantiasis—have been extirpated, never-

theless, with success. In particular, Titley removed, effectually, from a West Indian negro, a stupendous tumour, in the interior of which the genitals had long been buried, and which reached nearly to the ground, and weighed seventy pounds. Others of still greater weight and dimensions have been reported, and are said to have been successfully cut away. Larrey met with ten or twelve cases in Egypt weighing upwards of one hundred and twenty pounds. And in the German Ephemerides an instance is reported of a tumour which weighed more than two hundred pounds.

In performing such operations, the surgeon should endeavour, if possible, to ascertain the condition of the testes and penis, in order not to injure, or remove them unnecessarily. Mr. Liston, however, who operated on an enormous tumour of this description, many years ago, and with perfect success, says it was impossible to ascertain the situation of the genitals, and that he was more solicitous of preserving the man's life, than anxious about his organs of generation. The operation in some instances, proves quickly fatal, from irritation. This was the case in a Chinese, operated on by Mr. Aston Key, four or five years since. A similar disease is occasionally met with in females, and requires the same treatment. When small tumours occupy the scrotum or surface of the tunica vaginalis, they do not always require extirpation ; but, when necessary, the operation is easily performed, and a cure soon effected. I have known, however, very large sarcomatous thickenings of the scrotum, and tunica vaginalis, and also enormous hydro-sarcoceles in West Indians removed in a short time by a change of residence. In December, 1816, Captain D—— was recommended to my care by Robert Harrison, Esq., United States consul for the Island of St. Thomas, on account of an immense scrotal tumour which involved each testicle and spermatic cord, and was complicated with hydrocele. The patient stated that from long residence in Martinique and other islands, where he had been exposed from the nature of his occupations to hardships, and had drunk constantly of rain water, which was often in an impure state, his disease, as he believed, was to be attributed. While the patient was arranging his affairs and recruiting his health, to enable him to undergo an operation, the tumour gradually subsided, and in the course of two or three months

was entirely absorbed—and all the parts affected restored to their natural state.

Consult, on Diseases of the Tunica Vaginalis and Testis, Pott's Works, by Earle, vol. iii.; A Treatise on Hydrocele, by Sir James Earle, 1803; Bell's Operative Surgery, vol. i. p. 193; Cooper's Lectures, by Tyrrel, vol. ii. p. 86 ; Observations on the Structure and Diseases of the Testis, by Sir A. Cooper, p. 165; Ramsden's Practical Observations on Sclerocele, 1811 ; Richerand's Nosographie Chirurgicale, tom. iv. p. 258 and 262; Observations on a Peculiar Affection of the Testis, attended with the Growth of Fungus from that Organ, illustrated with Cases by W. Lawrence, in the Edinburgh Medical and Surgical Journal, vol. iv. p. 257; Dupuytren, Leçons Orales de Clinique Chirurg.; Sir B. Brodie, in Lond. Med. Gaz. vol. xiii. 1834; Cruveilhier, Anat. Patholog.; Cusack, in Dub. Journ. of Med. Science, vol. viii.; Wadd's Cases of Diseased Prepuce and Scrotum, 4to. 1817; Larrey's Surgical Memoirs; Case of Extraordinary Enlargement of the Scrotum, by J. M. Titley, Medico-Chirurgical Transactions, vol. vi. p. 73 ; Delonne's Case of Charles Delacroix, in Richerand's Nosographie Chirurgicale, tom. iv. p. 315 ; Liston's Practical Surgery, p. 340, Lond. 1839 ; Clot-Bey, in Travaux de l'Ecole de Med. d'Abou Zabel Egypte, Paris, 1833; Cheston's Patholog. Inquiries; Delpech, Chirurg. Clinique.

CHAPTER VIII.

DISEASES OF THE PENIS.

A MISTAKE into which writers, as well as practitioners, are extremely apt to fall,—that the penis, with one or two exceptions, is subject only to specific disease—should be corrected. Possessing the same texture and organization, (modified by certain peculiarities) as other soft parts, why should it not be liable to the same infirmities? That it is so, experience, our safest guide, has sufficiently proved; for, wounds and other injuries, simple and erysipelatous inflammations,—excoriations,—abscesses,—ulcers, simple, irritable, and indolent,—warts,—tubercles,—tumours, sarcomatous, encysted, steatomatous,—herpetic, and other eruptions, totally unconnected with syphilitic taint, or with other specific vitiation, sometimes the result of sexual intercourse, at other times entirely independent of it, the consequence often of abrasion, or mere mechanical injury, have been, always, more or less common in every country and in every age. It is not my intention, however, to treat of all these affections, but chiefly of simple ulcerations, of phymosis, paraphymosis, &c. Chancre, or the true syphilitic sore, has been noticed on a former occasion.*

* See vol. i. p. 225.

SECTION I.

WOUNDS OF THE PENIS.

THE penis is liable to incised, lacerated, contused, gun-shot, and other varieties of wounds. They may be the result either of design or accident, and numerous instances have been reported where maniacs, and persons under the influence of religious phrensy or hallucination, have removed both the penis and testicles. An extraordinary instance where an attempt was made, under a different feeling, to inflict a punishment of this description, occurred not long since, in the practice of an eminent surgeon of New York. A woman who had long lived unhappily with her husband, and from whom she had been separated for a considerable time, became apparently reconciled to him, and through the intervention of friends the parties consented to renew their nuptial intercourse. Prompted, however, by jealousy and a diabolic spirit, the virago, having provided herself with a razor, took it to her bed, and while her unfortunate Abelard was in the act of consummation, seized the penis, and with her weapon nearly severed it from his body.

The penis has been shot off in duels, or swept away by cannon or musket-balls or grape-shot, or so bruised and lacerated by these and other missiles, that it has afterwards sloughed and been lost. A severe bruise, or contusion, may likewise produce a different effect or lay the foundation of a specific disease, as in the following case. " I. Wallace," says Sir Everard Home, " a married man, thirty-seven years of age, stout made, subject to no general or particular complaints, and by profession a sailor, was admitted into St. George's Hospital, under my care, November 18th, 1803. About four years since, during a violent storm at sea, the main-top-mast was shivered, and the upper portion was swinging backwards and forwards. It was necessary to cut away the upper piece, and Wallace was sent aloft for that purpose. He had on a pair of loose trousers at the

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time.   The rolling of the ship was very great, which increased the motion of the mast, and while he was clinging to the standing part, his glans penis was caught between it and the loose piece; he immediately fainted away and fell into the round top, from whence he was carried to the deck.   On recovering, he was informed by his companions that when they first took him up his glans penis was as flat as a half-crown.   The body of the penis and both testicles, as well as the glans began to inflame and swell, and were extremely painful.   He kept his bed for three weeks, at the end of which time the glans had recovered its natural size and figure, having only a small pimple on that part to which the frænum is attached.   This was considered of no consequence, and was not at all troublesome until his arrival in England, six months afterwards, when it began to ulcerate and become very painful.   It is proper to remark, that he never had the venereal disease, and from the time of the accident never had intercourse with his wife or any other woman."* From that period the ulceration increased, assumed the cancerous form, involved the greater part of the penis and groin, and after the lapse of a year, proved fatal.   An interesting case was reported to me, five or six years ago, by Dr. Wm. S. King, of Russelville, Chester County, in which a young man, 17 years of age, had the genitals entangled in the machinery of a cotton factory, in such a way, that the skin was completely stripped from the pubes, penis, testicles, and perineum, as far as the verge of the anus, and although replaced by Dr. King, shortly afterwards, finally sloughed away, and endangered the patient's life —by irritative fever, and inflammation.

<center>TREATMENT OF WOUNDS OF THE PENIS.</center>

In cases of incised or lacerated wounds of the penis, the hemorrhage should be arrested by picking out the vessels with the tenaculum, or needle, and tying them, or by introducing a catheter into the urethra and making firm compression with a bandage on the penis.   After the hemorrhage has ceased, the edges of the wound must be drawn together by the interrupted

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* Home on Cancer.

suture, and supported by adhesive straps. The bandage should then be slackened or removed, as, if long continued, it will be apt to cause swelling and to excite erections. When the urethra is divided and the penis nearly cut through, as in the New York case, the catheter must be continued until reunion is established; otherwise, effusion of urine and sloughing may follow. Contused wounds of the penis will require poultices and fomentations, and after full benefit has been derived from these, should ulcerations remain, mild dressings, such as are used in simple ulcers in other parts of the body, may be resorted to. But in all injuries of the penis, an important indication is to repress erections—by the internal use of camphor, dulcamara, &c.

THE loose skin covering the glans, as well as that on the body of the penis, is subject to phlegmonous inflammation and abscess, which seldom, however, forms a large tumour, but upon breaking, or being let out with a lancet, discharges freely, and leaves an ill-conditioned sore, with an indurated margin, and excavated edge. The whole aspect of the ulcer, indeed, is at first so unfavourable as to cause it to be mistaken for chancre; though the rapid progress towards amendment, and the speedy filling up of the sore, will soon evince its true character.

The *Ulcus Erraticum* is met with, almost invariably, in persons of bad constitution, in dram drinkers, and in those who have suffered from the abuse of mercury. It may follow sexual intercourse or not, and is distinguished, generally, by this peculiarity—that the sore, which usually occupies the body of the penis, ascends in a spiral form, and, while it heals below, breaks new ground above, and in this way may encircle the penis, reach the groin and pubes, and devastate them. The edges of the ulcer are everted and indurated, the granulations foul, and the pain severe and burning.

Psoriasis Preputialis is an affection almost peculiar to those individuals who have the prepuce unnaturally long, tender, and succulent. It appears in the shape of deep fissures, or cracks, which pervade the edges of the prepuce, discharge at first a cohesive, and afterwards a purulent matter, bleed freely upon being irritated, are excessively tender or painful, and difficult to heal.

Herpes Preputialis differs from the foregoing affection in toto. It commences in the form of vesicles, which, upon breaking, leave, when situated on the inner surface of the prepuce a small round yellowish white ulcer, and when it occupies the outer skin of the prepuce, forms a scab. Each vesicle has its cor-

responding sore, which often unites with those adjoining it, until one unbroken surface of ulceration is established. From experiments made by Mr. Evans, it appears that the sore is not contagious. The same writer imputes the disease to derangement of the digestive organs.

Excoriatio, or abrasion of the cuticle of the glans penis or prepuce, may be the result of inordinate friction, of preternatural tenderness of parts, of undue secretion of that whitish, cream-cheese-like, sebaceous matter, which seems almost peculiar to certain persons, of filth, or want of accurate ablution, of connexion with foul and unwholesome women, particularly such as have laboured for years under fluor albus and other acrimonious discharges, of extraordinary inequality of size between the male and female genitals, &c. From any of these causes, troublesome ulcerations may arise, and are often confounded with syphilitic sores. But their external characters are sufficiently marked, in general, to enable a careful surgeon to distinguish them from other ulcerations. In particular, these ulcers are superficial, irregular, in separate patches, of a yellowish hue in the commencement, but surrounded, in the advanced stage, by a red areola. Extraordinary itching, together with undue serous or purulent secretions, followed, in some instances, by sympathetic enlargement of the inguinal glands, are the remaining symptoms.

TREATMENT OF ULCERS OF THE PENIS.

Phlegmonous inflammation of the penis is rarely susceptible of resolution. The sooner, therefore, the matter is evacuated by a lancet, the better. An emollient poultice of bread and milk, ground flax-seed, and particularly of the powdered bark of slippery-elm, may then be applied, and renewed frequently for a day or two. Afterwards, the mildest unctuous dressing and lotions may be employed. Should fungus granulations arise, the sulphate of copper and lunar caustic will be required.

Ulcus Erraticum, like the common irritable ulcer of other parts, frequently proves refractory. It should be coaxed and humoured by soothing and sedative lotions, such as the acetate of lead, and sulphate of zinc blended with gum Arabic and opium.

Very weak solutions of argentum nitratum, and nitric acid, extremely diluted, will also prove useful. Acrid and stimulating applications generally fret and annoy it. The blue pill, as an alterative, and great attention to diet, with rigid observance, in plethoric patients, of other parts of the antiphlogistic system, will sometimes do more good than all the local remedies that can be thought of. In patients prostrated by intemperance, or other causes, a system of support or nourishment must be instituted, and corresponding applications to the sore, and internal medicines e nployed.

For *Psoariasis Preputialis*, various astringent lotions and ointments are generally used, and, according to Evans, the best application is the unguentum hydrargyri nitrati, reduced to one-half its ordinary strength.

Herpes Preputialis is benefited by attention to diet, by the occasional use of gentle purgatives, and by the mildest local applications. Keeping the parts perfectly clean, and suffering them, when disposed so to do, to form a scab, will effect a cure, in a very short time.

Simple *Excoriations*, unconnected with specific disease, may be removed speedily, by guarding against erections, by the use of simple ointments perfectly fresh, by moderately astringent lotions, and, when the sores become indolent, by gentle, occasional touches of argentum nitratum, and weak solutions of corrosive sublimate mixed with spirit of lavender or alcohol.

SECTION III.

PHIMOSIS.

THERE are two varieties of this disease—the *natural* and *preternatural*. The former exists at birth, and is therefore congenital; the latter may occur at any period of life. In both cases the prepuce is contracted in front, and cannot be drawn backwards over the glans penis.

Natural phimosis is a very common complaint, and met with under two or three different forms. Sometimes, though rarely, the extremity of the prepuce is perfectly closed, and the urine cannot pass off, but collects between the glans and prepuce, forming a large bag or tumour. The disease is of course discovered a short time after birth, but is often not understood, and from this cause several infants have perished that might have been saved by a trivial operation. Another form of natural phimosis is that in which an opening exists at the extremity of the prepuce, but so small as not to permit the urine to escape from it with the same rapidity it issues from the urethra. Consequently, it collects between the prepuce and glans, and distending the former to a great size, is then forced off gradually in a very fine stream, and to a great distance.* If the disease should continue in this state for several years, as I have known to happen, pus and calculi may collect within the cavity of the distended prepuce, and keep up a constant irritation. But, in most instances, there is no impediment to the flow of urine, no extraordinary elongation of the prepuce; yet the skin is so closely contracted around, as to prevent the patient from uncovering the glans penis. From this, other inconveniences result. A whitish sebaceous matter collects in large quantity between the glans and prepuce, and excites so much irritation, as to produce a disease resembling gonorrhœa—with which it is often confounded. Besides this, the inflammation excited by this, or any other cause, may produce an adhesion between the glans

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* I saw recently a case of the kind in a calf.

and prepuce, which can only be relieved, and that not always, by a most severe and tedious dissection.

Preternatural phimosis is commonly the result of inflammation of the prepuce, by whatever cause induced. The disease often accompanies severe gonorrhœa, extensive chancres, and venereal warts. Sometimes matter accumulates behind the corona glandis, and is followed by ulceration of the prepuce, and a protrusion of the glans through the opening. The inflammation attending preternatural phimosis, is sometimes of the erysipelatous kind. Extensive sloughing of the prepuce is frequently the consequence, in bad constitutions, of the continued exhibition of immoderate quantities of mercury.

TREATMENT OF PHIMOSIS.

Natural phimosis, if it exist at birth, and be complete, will require an immediate operation, in order to save the infant's life. A puncture with a common lancet in the most prominent part of the tumour, may answer every purpose, as the stream of urine will afterwards prevent the opening from closing. When the prepuce has become distended, from repeated collections of urine, the small opening in its extremity may be either enlarged, or the superfluous bag amputated. The latter will prove the most effectual, and should be resorted to generally.

A simple phimosis, when only inconvenient to the patient by impeding copulation, may be relieved by slitting up the prepuce at its middle as far as the corona glandis. The operation can be performed with a sharp-pointed bistoury, or still better by the sheathed knife employed by Dr. Physick for fistula in ano. Hemorrhage sometimes follows the incision, but in general is easily suppressed by a dossil of lint. Before the parts are dressed, the surgeon must take care to tack the two layers of skin to each other by a single stitch of the interrupted suture. The edges of the prepuce, thus divided, retire from each other, and after they are healed, become continuous, and resemble the borders of a prepuce naturally formed. This has been denied by some surgeons, who allege that two flaps or angles are left, which afterwards prove very inconvenient to the patient. I have performed the operation very frequently, and never expe-

rienced such a result. Instead of splitting open the prepuce anteriorly, and thereby obviating deformity, Cloquet, Liston, Wallace, and some other surgeons prefer passing a director parallel with the frænum, and dividing the two membranes at a single stroke of the knife—taking care, as suggested by Liston, that the director be not inserted into the urethra.

Preternatural phimosis, when complicated with gonorrhœa or chancres, and attended with high inflammation, should never be touched with the knife. The best remedies, under such circumstances, are local blood-letting, emollient poultices, fomentations, and accurate ablution of the glans by means of a syringe. The continuance of mercury will prove immensely injurious. After the inflammation has entirely subsided, if adhesions should have formed between the glans and prepuce, uniting them firmly to each other, an attempt may be made to separate them by dissection, provided the patient is willing to encounter a most severe operation,—one compared by Petit " to the skinning of an eel,"—rather than submit to his misfortune. The operation, however, I have often found absolutely necessary to perform.

SECTION IV.

PARAPHIMOSIS.

PARAPHIMOSIS is the reverse of phimosis—the prepuce being retracted behind the corona, leaving the glans uncovered. The disease may be either congenital or acquired, but the latter is the most common. Sometimes it is the result of the successful retraction of the prepuce in cases of phimosis; but generally it proceeds from inflammation induced by syphilis or gonorrhœa. So extensive is the swelling, in some instances, and so great the constriction produced by it, that the glans penis, or prepuce, occasionally mortifies and drops off. This termination, however, must be considered as comparatively rare. I have known paraphimosis to proceed, in some instances, from erysipelas, and in other, from collections of sebaceous matter between the prepuce and glans penis. In such cases sero-purulent matter, or ill-conditioned pus, very abundant, and very fetid, has collected in the cellular tissue of the skin of the penis, or in the cells of the corpus spongiosum, or cavernosum, and has been discharged from one or more fistulous orifices—giving rise, eventually, to condensations, and adhesions, which may interfere with erections and other functions of the penis.

TREATMENT OF PARAPHIMOSIS.

If called in time, or before the swelling attains a great height, the surgeon may often succeed in restoring, by steady pressure with the fingers, kept up for several minutes without intermission, the prepuce to its natural situation. The application of very cold water to the parts will also contribute towards the same end. Punctures, too, when there is much œdema, as generally happens, afford great relief, by evacuating the serum and reducing the swelling. This treatment, together with an

observance of the antiphlogistic system, will usually effect a cure in a short time; should this not prove to be the case, and gangrene of the parts be likely to follow, the division of the stricture must be attempted. To accomplish this, a fold of the skin should be raised and cut through, a director pushed beneath the stricture, and the latter divided by a bistoury. In cases of erysipelas of the prepuce, leeches, cold washes, slight incisions, followed by poultices, and by mercurial ointment, I have found useful. Steady purging, too, has proved exceedingly useful, especially in corpulent subjects, and those accustomed to luxurious living.

On Phimosis, Paraphimosis, and other Diseases of the Penis, consult Petit's Traité des Maladies Chirurgicale, et des Operations qui leur Conviennent, tom. ii.; Hunter on the Venereal; Cooper and Travers's Surgical Essays, part i. p. 145; Richerand's Nosographie Chirurgicale, tom. iv. p. 328; S. Cooper's First Lines of the Practice of Surgery, vol. ii. p. 176; Wadd's Cases of Diseased Prepuce and Scrotum, 4to. London, 1817; Pathological and Practical Remarks on Ulcerations of the Genital Organs, by James Evans, Surgeon to His Majesty's 57th Regiment, London, 1819; Liston's Practical Surgery; Velpeau, Nouv. Elem. de Med. Operat.

CHAPTER IX.

DISEASES OF THE URETHRA AND BLADDER.

VOLUMES have been written on these subjects; and there is scarcely an eminent surgeon of any age who has not devoted some portion of his writings to their explanation. This will show the importance of these diseases, and the difficulties encountered in their treatment. In a work professedly elementary, it will not be expected that more than a very general sketch on such topics can be furnished. Ample scope, however, must be taken in the lectures—such, I trust, as will abundantly supply any deficiency that may be here met with. The diseases of the urethra and bladder, that remain to be considered, are stricture, fistula in perinæo, enlarged prostate, retention and incontinence of urine, sensitive tumours of the female urethra, and stone in the bladder.

SECTION I.

STRICTURE OF THE URETHRA.

THIS is a very common complaint; more common, indeed, than is generally imagined. It may proceed from various causes—from gonorrhœa, or the remedies employed in the cure of that disease; from external violence; from irritation within the urethra, produced by the passage of calculi, or the application of blisters to the perineum or other parts of the body; from excessive indulgence in venery, or unnatural prolongation of the venereal act; from enlargement of the prostate gland; from stone in the bladder, &c. It is somewhat remarkable, however,

that the disease seldom makes its appearance until years have elapsed, and the effect of the causes above enumerated has appeared to cease. Many surgeons question the propriety of referring the origin of stricture to gonorrhœa, without, I conceive, sufficient foundation ; though it must be acknowledged that the disease is sometimes met with in very young boys, and in adults who have led the most exemplary lives.

Strictures have usually been divided into two kinds—the permanent and spasmodic. To these Mr. Hunter added a third variety—which is alleged to consist in a combination of the two. Permanent stricture may be said to consist of a thickening or change of structure in the urethra, induced by preceding inflammation. That spasmodic stricture frequently exists, there cannot be the smallest doubt, though it is still a question whether the spasm should be referred to the muscularity of the urethra itself, or to the muscles surrounding that canal ; a question, however, in a practical point of view, of comparatively small importance. Yet I must confess my willingness, for various reasons, to subscribe to the latter doctrine.

There is seldom much variation in the *seat* of a stricture ; which is usually found behind the bulb of the urethra—about seven inches from the extremity of the glans. At the distance of four or five inches, also, and three inches and a half, measuring from the outer orifice of the urethra, strictures may be often discovered. Sometimes the orifice itself is the seat of stricture. Most patients have but one or two strictures, others four or five.

Strictures differ from each other in *extent* and *consistence*. The most common form of the disease is that which resembles the effect of a thread tied around the canal ; it is likewise the most simple variety of stricture. Sometimes the canal of the urethra is regularly contracted or thickened, in one or more places, to the extent of an inch and upwards. The simple thread-like stricture, which does not always run in a circular direction, but sometimes splits and branches, may by irritation or bad treatment be converted into a callous induration. When examined by dissection, most permanent strictures will be found to consist of a dense, pure white, fibrous substance, like gristle —the result of previous and repeated depositions of coagulable lymph.

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The *symptoms* of stricture of the urethra, are *constitutional* and *local*. Among the former may be enumerated, disorder of the digestive functions, general irritability of the system, various mental emotions, severe chills, followed by high fever and profuse perspiration. All patients, however, are not subject to the febrile paroxysm. The most common local symptoms are, a slight discharge of matter from the urethra; a frequent desire to evacuate the urine, which issues in drops, or in a forked, twisted, wiry, or thread-like stream; nocturnal emissions; scalding of the urine; uneasiness about the anus and perineum. Persons troubled with strictures, are extremely liable to cold, which greatly aggravates the symptoms. Excess in eating or drinking will produce the same result. During copulation, it frequently happens that a stricture, by interrupting the flow of semen, occasions it to be forced backwards into the bladder, from which it is afterwards discharged the first time the patient makes water.

In bad cases of long standing stricture of the urethra, the walls of the bladder not only become thickened—sometimes to the extent of an inch—and the cavity of that viscus so much contracted as scarcely to contain any urine, but the ureters enlarge enormously—in some instances to the size of an intestine. Their coats, also, are much thicker than natural; and from the constant strain and pressure upon the kidneys, from the reflux or regurgitation of the urine, these organs suffer in proportion, and lay the foundation of great constitutional disturbance. Some fine specimens of enlarged ureters from strictures, and stone in the bladder, are contained in my cabinet, both in old and young subjects.

Stricture is often confounded with other diseases; especially with gonorrhœa, gleet, stone in the urethra or bladder, enlarged prostate, spasm of the muscles of the perineum, irritation or inflammation of the lacunæ, intermittent fever, &c.

TREATMENT OF STRICTURE OF THE URETHRA.

In the treatment of this disease, the first object of the surgeon should be to ascertain the situation and extent of the stricture.

This may be done by a bougie, catheter, or urethra sound.* A soft white bougie of moderate size, well oiled, will excite as little irritation as any other instrument, and is well calculated, when softened by the heat of the urethra, to take an exact impression, with its point, of the form of the obstruction, and of its precise situation. Over the bougie, however, in many instances, the urethra sound possesses a decided advantage, since, from its metallic nature, and the small size of its wire rod, it communicates a vibration to the surgeon's finger, and passes easily along the urethra, while the ball at its extremity catches readily upon any irregularity of the canal, and in this way detects the slightest obstacle. With this instrument, moreover, the situation of several strictures may at the same time be ascertained—an advantage which the bougie does not combine.

Having satisfied himself of the nature of the stricture, its position and extent, the surgeon must next determine upon the means to be employed for its removal. There are three or four methods in common use—dilatation of the stricture by waxen, metallic, or gum elastic bougies,† destruction of it by the lunar or vegetable caustics, and its division by a stilet. Each is adapted to particular cases. When the strictures are numerous and of considerable length, neither the caustic nor stilet can be employed to advantage, and dilatation by the bougie must be mainly depended upon. In using this, the surgeon should make it a rule to proceed as gradually and cautiously as possible, commencing with an instrument of moderate size, such as will pass readily through the strictures without giving pain or producing hemmorrhage. It should be worn morning and evening,

* An instrument invented by Sir Charles Bell, made of silver wire, twelve or fourteen inches long, having at one end a ball, at the other a ring; the former intended for the stricture, the latter for the surgeon to hold by while the instrument is introduced.

† The finest bougies I have ever seen, were prepared by the late Dr. Balfour, of Norfolk, Virginia; a gentleman remarkable for his intellectual endowments, amiable character, and mechanical ingenuity, and whose death will long be deplored by the inhabitants of the district in which he resided. The wonderful dexterity which he possessed in the manufacture of instruments, of every description, is evinced in the splendid collection of *splints* and *bandages*, presented to the museum of our university, in 1830, by his son, Dr. Eleazer Balfour, a most promising young practitioner of Norfolk. Many of the instruments referred to are of exquisite finish and workmanship, such as would puzzle, if not defy, the best regular mechanic in the country to imitate or equal.

while the patient is in bed, or at regular intervals during the day, taking care not to continue it too long, but, on the contrary, to withdraw it when undue irritation is excited by its presence. Having derived full benefit from the use of one instrument, others should be introduced, proportioned in size to the extent of the dilatation—being gradually increased. In many instances, the constant use of these instruments, for a few weeks, will effect a perfect cure, in other cases, months or years will elapse, before the patient derives the necessary relief. *Silver* bougies, when well made, are better adapted to the dilatation of a stricture than most others. A set of instruments of this description, of peculiar construction, manufactured under my direction by Mr. Warner of Greenleaf Court, I have employed for many years with great effect. Many patients, however, experience great benefit from the use of the flexible metallic bougie. For very long and narrow strictures, I have used, with much advantage, for many years past, fine, highly polished, and very flexible whalebone bougies.

Caustic has long been employed in the cure of strictures. It was a favourite practice with Mr. Hunter, and has since been highly extolled by his relation, Sir Everard Home. I have employed the remedy, for many years, sometimes advantageously, at other times, with manifest aggravation of the symptoms. From all I have seen, I am disposed to conclude, that it is only adapted to strictures of small extent—such as the thread-like stricture. That much mischief has resulted from its indiscriminate and injudicious application, I well know; but its strongest advocates, also confess, that in their own hands, false passages, hemorrhage, great irritation, severe paroxysms of fever, and other ill consequences, have often been induced. These remarks will apply to the vegetable as well as lunar caustic, although the former has been considered by some writers to be milder in its operation, and to act upon a different principle from the lunar caustic. When a stricture is very small, and situated near the extremity of the urethra next to the glans penis, and there is reason to believe, that one or two applications of the caustic will go through, it may be applied in the following way. The surgeon takes a common soft bougie, oils it, carries it nimbly down to the stricture, keeps it in contact with it a few seconds, and marks with his finger-nail

the bougie at the external orifice of the urethra before he with-draws it. Another bougie, composed of firmer materials, is next taken, a hole about the eighth of an inch in depth, scooped from its extremity by a sharp penknife, and a portion of lunar caustic inserted into it, and secured by squeezing together the edges of the hole—leaving the central part of the caustic a little exposed. A mark corresponding to that on the soft bougie, (which is intended to designate the depth of the stricture from the external orifice,) is then made upon the caustic bougie, and the latter, at once oiled and carried down to the stricture, and kept in contact with it for one or two minutes, or for a shorter period, should the patient complain of its severity. In two or three days' time the operation may be repeated, and occasionally within the same period until the stricture gives way, or is entirely removed.

The *stilet*, although used by some of the older surgeons, in the cure of stricture was not practised in modern times, until recommended by Dr. Physick. In 1795, he first performed the operation, and ever after continued to employ the same means, and oftentimes with the greatest success. I myself have likewise succeeded, in many instances, in effecting a perfect cure, after bougies, the caustic and other means, have entirely failed. Before the clinical class in the Philadelphia Hospital, some years ago, I perforated, with the stilet, a stricture of long stand-ing, near the bulb, which had resisted for seven years the efforts of different surgeons, to introduce an instrument of any descrip-tion into the bladder. In three minutes after the division of the stricture, a catheter entered, and the patient experienced the greatest possible relief. What renders this plan of treating strictures the more valuable, is the circumstance of the opera-tion being attended with very little pain, and with no risk, pro-vided the operator possess an accurate knowledge of the structure of the parts. In ignorant hands, false passages, ulcerations, and effusion of urine may follow. The instrument used by Dr. Physick, is a sort of lancet concealed in a cannula, that may be pushed forward or retracted at pleasure. When it becomes necessary to pierce a stricture situated near the bulb of the urethra, a curved instrument should be used. Upon several oc-casions I have used with success, in strictures seated near the anterior part of the urethra, a common couching needle, rendered

blunt at the point, and sharpened at its edges. After the division of the stricture, a bougie or catheter must be worn for some time, to prevent the passage from closing again.

From the use of bougies or the caustic, it very often happens that an unnatural route or *false passage* is created. This is owing, generally, to unskilfulness on the part of the surgeon, or patient himself, or to the use of instruments so small as to enter the lacunæ of the urethra, instead of following the natural course of the passage. When once established, a false passage is extremely difficult to remove, and, on this account, great pains should be taken to guard against its formation. To the patient the disease is inconvenient, chiefly by preventing the easy introduction of the bougie or catheter, and sometimes, on this account, dangerous in cases of retention of urine. The best plan, in general, of destroying the unnatural route, is to use a bougie larger than the one by which the disease was created, and to bend its point towards that part of the urethra opposite to the false passage. A large catheter, very much curved, will also pass, in many instances, where no other instrument can be made to follow the natural course of the urethra. Mr. Hunter was in the habit, sometimes, of performing an operation for the removal of this disease; fortunately, however, such an expedient can rarely, if ever, prove necessary. But in three or four instances, I have succeeded in establishing the natural course of the urethra, where the false passage depended upon the resistance of a stricture, by piercing the stricture with a stilet, and afterwards passing a catheter through it, and suffering it to remain in the bladder for several days.

Formerly, a few English surgeons of eminence were in the habit of *forcing* strictures, by driving bougies and catheters through them, and making an entrance by violence into the bladder. A similar practice for several years past has prevailed in France, where an instrument called *sonde conique*, is much in vogue. I will not condemn the proceeding, because I do not know it, from experience, to be hurtful; but I confess I have a feeling amounting to prejudice against it. Mr. Arnott's method of curing strictures, by the peculiar instruments named dilators, has gained few advocates among surgeons.

SECTION II.

FISTULA IN PERINÆO.

From stricture of the urethra, from blows and other injuries, fistula in perinæo is frequently produced. In proportion as a stricture increases, the urethra, at the diseased part, is diminished; while that portion of the canal immediately behind the obstruction, by the efforts of the bladder and the continual propulsion of the urine against it, is enlarged. The irritation thus kept up gives rise to inflammation and ulceration, and an opening is at last made through the urethra, and communitates with the cellular membrane surrounding it. Into this opening the urine finds its way and lodges, and by its acrimony increases the irritation until an abscess is formed; which gradually enlarges, and finally discharges itself externally. The urine then passes out mixed with matter, both from the opening in the perineum and from the external orifice of the urethra. In the course of time, however, it frequently happens that the strictured part of the canal, no longer feeling a forcible impulse from the stream of urine, gradually closes, and is finally obliterated; after which the whole of the urine is evacuated through the fistula. Sometimes, instead of the ulcerative process first commencing on the internal surface of the urethra, an abscess is formed from irritation in the cellular membrane exterior to the canal, into which the ulceration at last extends, and throws the two cavities into one. Fistula in perinæo sometimes proceeds from a rupture of the urethra,—produced by external violence, or by the force of the urine upon the inflamed and tender part of the canal behind the stricture,—and the urine is instantly sent abroad into the loose cellular membrane of the perineum and scrotum, where it forms an enormous distension or tumour, and excites most violent inflammation, that terminates in a few hours in gangrene, and sloughing of the scrotum—leaving, in many instances, the testicles and urethra bare, and endangering the

patient's life.   There is seldom more than one fistulous opening
communicating immediately with the urethra, but from it nume-
rous sinuses generally extend in various directions ; and in cases
of long standing, it is not unusual to find the cellular membrane
of the scrotum and of all the other parts through which the
urine meanders, greatly condensed and converted into indurated
tumours, upon the surface of which may be found innumerable
small holes, that discharge offensive urine and matter—render-
ing the patient disagreeable to himself and disgusting to his
neighbours.

TREATMENT OF FISTULA IN PERINÆO.

It will appear obvious, from what has been stated, that when
fistula in perinæo depends upon stricture, the first indication in
the treatment of the disease should be to get rid of the obstruc-
tion, and to enable the stream of urine to regain its natural route.
This, if the canal anterior to the fistula is obliterated, can be
accomplished only by an operation, and the one which I have
usually performed, and frequently with success, is as follows.

The urine being retained in as large quantity as possible, the
patient is placed upon his back on a table covered with a mat-
tress or blankets, the thighs bent upon the pelvis, and the legs
upon the thighs, separated and supported by an assistant on each
side.   A female catheter or sound is then carried down to the
stricture, and there held firmly by another assistant, while the
surgeon introduces a probe into the largest fistulous orifice he
can find, and the one nearest to the stricture, and endeavours to
feel with it the extremity of the sound, through the walls of the
urethra.   An incision, proportioned in length to the extent of
the disease, is next made in the perineum, along the course of
the probe, until the urethra or its remains are laid bare, when
the operator will be enabled to cut upon the extremity of the
sound, and divide the stricture.   The sound may be afterwards
withdrawn, and a gum elastic catheter introduced at the glans
penis, and carried along the urethra into the bladder, where it
should be suffered to remain for several days.   As soon as the
natural route for the urine is thus re-established, the fistulæ
diminish, the indurated cellular membrane contracts, the wound

begins to fill up, and is finally closed, and, through the medium of granulations, which form around the catheter, a new urethra is created; after which the sinuses all heal, and the patient recovers. In many instances, the operation is extremely difficult, and very painful, especially in irritable patients, and those who have suffered a long time from the complaint. Cases, indeed, are reported of patients having died under the operator's hands.

When a fistula in perinæo is complicated with *pervious* stricture, an attempt should be made by bougies, caustic, and other means, to destroy the stricture, or enlarge it, and afterwards to heal the fistulous opening by escharotics; the best of which, for this purpose, is the argentum nitratum. When the catheter can be passed through the stricture into the bladder, it should always be done, and an attempt made to heal the fistula without the knife. This mode, however, requires a long time to effect the purpose. Sometimes a fistula in perinæo will contract to the size of a hair, and in that state remain for years, now and then shedding a few drops of urine. For this state of the disease, I have found a *blister* the best remedy.

Effusions of urine into the cellular texture of the scrotum, from rupture of the urethra, require very decisive measures. Aware of the nature of the disease, the surgeon should lose no time in making very free punctures and incisions into the skin and cellular membrane, from which he will soon find the urine to issue in considerable quantity. When performed in time, the operation may save the parts from sloughing. This, however, is seldom the case. But it is astonishing how much nature does for the patient under these circumstances: for even after the testicles have been entirely divested of integument, a new scrotum is almost always formed out of the adjoining parts. The fistula, in general, heals spontaneously.

SECTION III.

ENLARGED PROSTATE.

ALTHOUGH the prostate gland is subject to inflammation, abscess, scrofulous enlargement, and collections of urinary calculi within its substance, these affections are rare, compared with that commonly known under the name of scirrhus. To this disease old people are almost exclusively liable, and so frequent is it among them, that, according to Sir Everard Home, few subjects beyond the age of eighty are exempt from it. The middle lobe, as well as the two lateral, is often the seat of the disease; but the symptoms differ, in some respects, according as the former or latter happen to be affected. In proportion as the middle lobe enlarges, it pushes before it the internal membrane of the bladder, and by projecting into the cavity of that viscus, immediately behind the inner orifice of the urethra, obstructs the flow of urine; which, when the tumour, as it often does, attains considerable bulk, may be entirely suppressed. The enlarged lobe also, in many instances, becomes ulcerated, and gives rise to severe pain after passing urine, and to spasm about the neck of the bladder.

When an enlargement of one or both of the lateral lobes of the prostate is conjoined with that of the middle lobe, the symptoms are still more urgent. A discharge of a viscid, ropy mucus, is another attendant upon enlarged prostate, and a very common symptom of the disease of the lateral lobes. The left lateral lobe is more frequently enlarged than the right. When the lateral lobes attain a considerable size, they project towards the rectum so as to diminish the capacity of that bowel, and may be distinctly felt by the finger per anum.

The *causes* of enlarged prostate are exceedingly obscure. By many the disease is attributed to syphilis, repeated attacks of gonorrhœa in early life, strictures of the urethra, inordinate indulgence with women, high living, intemperance, &c.

But these inferences are rather gratuitous than founded upon any certain data.

TREATMENT OF ENLARGED PROSTATE.

The remedies for this disease are palliative only. Opium, internally administered, and in the form of an enema, will prove highly serviceable in subduing spasm about the neck of the bladder, and thus enabling the patient to pass urine. Frequently, however, every effort of the kind will be unavailing, and the catheter must be employed. One of elastic gum, without the stilet, very flexible at the point, and of large size, will be found to give less pain, and enter with greater facility than a metallic instrument. It should be kept in the bladder for several days in succession, and after the urgent symptoms have somewhat subsided, introduced occasionally. Mr. Liston recommends a silver catheter, very much curved, and at least an inch and a half longer than the ordinary instrument, for drawing off the urine in cases of enlarged prostate. In addition to this treatment, the use of mild purgatives, and attention to diet, will be required. Many years ago an ignorant physician of Baltimore opened the fundus of the bladder, and attempted to *extirpate* the enlarged prostate—with what result I need not say.

SECTION IV.

RETENTION OF URINE.

From severe gonorrhœa, strictures in the urethra, enlarge-
ment of the prostate gland, spasm at the neck of the bladder,
stone in the bladder, hemorrhoids, fistula in ano, rupture of the
urethra, blows upon the perineum, stimulating diuretics, the
application of blisters, injuries of the spine, paralysis of the
bladder, stones in the urethra, and some other causes, a reten-
tion of urine frequently arises.

The disease, when it occurs amongst old people from para-
lysis, is not often followed by serious consequences, unless it should
be mistaken for an *incontinence* of urine ; a mistake which is apt,
among the inexperienced, to arise from the circumstance of the
urine constantly passing off by drops or in a small stream—one
of the most decided symptoms of *retention*. Persons advanced in
age are extremely apt to neglect the calls of nature, and suffer
the urine to collect in the bladder in large quantity, or when
they do make water, are not particular enough in discharging
the whole of it. From these, and other causes, the bladder at
last loses its power of expulsion, and the urine accumulates. As
a part of it, however, is in general continually passing off by the
urethra, that in the bladder seldom exceeds a certain quantity,
and in this way the disease may be kept up for weeks together.

The retention which takes place in young people, from go-
norrhœa, strictures, or any inflammation or excitement about
the urethra, neck of the bladder, or neighbouring parts, is very
different in its character, and often in its result, from that just
spoken of. The urine seldom escapes, even in the smallest
quantity, by the urethra, and must of course accumulate, (unless
the patient be relieved,) until some part of the bladder gives way
—either by ulceration or sloughing. It is astonishing, however,
to what an extent the bladder will yield in some cases before its
parietes are destroyed. Some years ago I was called to a child

about two years of age, supposed to labour under ascites, and so strongly did the enlargement and feel of the belly resemble that disease, that I at first took it to be a case of the kind. But, upon inquiring into the history of the complaint, I ascertained that its duration had not exceeded seven days, and that during this period the patient had passed no urine. This induced me to examine the urethra, in the mouth of which I discovered a calculus that blocked up the passage completely. Upon enlarging the orifice with a lancet, the stone was instantly pushed out, and followed, to the surprise of a medical attendant and myself, and to the great relief of the patient, in a little time, by two quarts of urine.* Many instances are related by writers, of the bladder becoming so distended by urine, as to rise above the umbilicus; and Sir Everard Home relates an instance in which the celebrated Mr. Hunter actually tapped the bladder, mistaking the swelling for a dropsy of the belly. But such cases are anomalous; and in most instances, long before the bladder is distended to a great size, it ulcerates, or sloughs at the fundus or neck, and the urine is sent abroad into the peritoneum, or discharged through the rectum, or into the cellular membrane of the scrotum or perineum. In either event the patient generally dies. During the progress of the distention the patient suffers exceedingly, grinds his teeth in agony, tosses about the bed, or walks his room with his body almost bent to the floor, is seized with chills, cold sweats, and fainting, which are followed by fever, great restlessness, extreme thirst, intolerable anguish, swelling of the abdomen, hiccup, delirium, and death. He seldom survives beyond the sixth or seventh day.

TREATMENT OF RETENTION OF URINE.

When retention of urine arises from stricture of the urethra, or from any inflammatory affection of the canal, or parts adjacent, blood-letting, the warm bath, purgatives, and opiate enemata, should have a full trial. If these fail, a gum elastic bougie may be carried down to the obstruction, and kept in contact with it a few seconds, after which, in many instances, the urine will

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* A case nearly similar is reported by Dr. Parrish.

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flow. Should this, however, not produce the desired effect, the surgeon will then endeavour to introduce a catheter into the bladder. Than this, there is not, in all surgery, a more important, and, under certain circumstances, more difficult operation —an operation requiring the utmost gentleness, patience, perseverance, and skill. Rudeness and force, indeed, independently of the unnecessary pain and punishment they inflict, seldom contribute towards the end in view. It is true that some eminent surgeons, in difficult cases, advise the forcible entry of the catheter; but it should be remembered that a great majority of others, not inferior to them in authority, condemn the practice in the most pointed terms.

In general, the most favourable position for the easy introduction of the catheter, is the recumbent. But a good rule to observe on such occasions, is, if the surgeon does not succeed, readily, while the patient is in one position, to change it for another. The curvature of the instrument is also a matter of importance; on this account, the operator should be provided with a number, varying in shape and size. Gum elastic catheters, with or without the stilet, are better suited to most cases than metallic instruments. Sometimes, however, I have succeeded, easily, with a silver catheter, when a gum elastic would not enter. In using the latter, there is an advantage now and then obtained, especially when the middle lobe of the prostate is enlarged—in withdrawing the stilet an inch or two, so as to leave the extremity of the instrument more flexible than it otherwise would be. With the same view, Dr. Physick was long in the habit of using a gum elastic catheter, with a flexible wax bougie fixed upon its extremity. Stilets made of brass, instead of iron wire, are in many respects the most useful.

Having oiled the catheter, the surgeon takes hold of the glans penis, on its sides, immediately behind the corona, enters the instrument, with its concavity towards the abdomen, at the urethra, carries it along steadily, and with one continued sweep, —the penis being drawn upwards at the same time upon the instrument, and laid nearly parallel with the abdomen,—until it reaches the bulb or triangular ligament of the urethra. Here the passage takes a sudden turn upwards, and it will be necessary to accommodate the point of the catheter to the curve. With this intention, the handle of the instrument is suddenly,

but cautiously and without force, depressed. This manœuvre elevates the point, and causes it to start over the edge of the triangular ligament, and enter the bladder. Should much difficulty be experienced, however, in this stage of the operation, it may be often overcome by placing a finger in the rectum, and, with it, lifting the end of the catheter. Whenever an obstruction is met with in the urethra, which the catheter does not readily pass, instead of attempting to overcome it by force, it will be proper always to withdraw the instrument a little, elevate its point, and then push it on again.

In retention of urine from *paralysis*, the introduction of the catheter is seldom attended with difficulty, and on this account the operation may be repeated two or three times a day, or as often as may become necessary. But when the surgeon finds it inconvenient to attend for that purpose, a flexible catheter may be left in the bladder, for two or three days at a time, and the urine permitted to flow off, at stated periods, in place of dribbling away constantly. After the bladder has recovered its tone, the catheter should be discontinued. Having experienced considerable difficulty in introducing the cathether, in some obstinate cases of retention of urine, it occurred to me, in 1811, that the resistance might, perhaps, be overcome by introducing the pipe of a syringe into the orifice of the urethra, and throwing in, gently, a stream of tepid water. Having accordingly tried the plan, successfully, in a few cases, I was induced to recommend the practice for several years, in my lectures. Subsequent experience, however, taught me that very little reliance could be placed upon the method, and I have since abandoned it altogether. *Amusat*, of France, has, within the last few years, resorted to a similar expedient, and, according to his own account, with great success.

If, in spite of the efforts of the surgeon to relieve the patient, by the remedies pointed out, and it is found impossible to introduce the catheter, it will become necessary to *puncture* the bladder. The operation may be performed above the pubes, or through the rectum. But it will be proper to premise that neither one nor the other is indispensably necessary once in a hundred times.

The operation *above the pubes* is performed in the following way. The patient being laid upon a table, an incision, about

an inch and a half long, is made in the linea alba, immediately above the pubes, through the integuments and fat, and between the pyramidales muscles, until the distended bladder is distinctly felt, when a curved trocar, six inches in length, covered by its cannula, is made to pierce the bladder as near the pubes as possible. A vessel being held between the patient's thighs to receive the urine, the stilet is withdrawn and the fluid evacuated. To prevent the cannula from slipping out, tapes are fastened to its wings, and secured to a bandage passed around the body. Its extremity is also plugged up, to prevent the perpetual flow of the urine. The greatest objection to this operation, is the liability of the urine to escape, (after the bladder becomes flaccid,) into the cavity of the abdomen. Besides this, the constant presence of the silver cannula is apt to excite irritation, especially when it is so long as to rest upon the back part of the bladder.

The puncture of the bladder, *through the rectum*, I should prefer, in every instance, provided the prostate was not so much enlarged as to require the instrument to be introduced high up the intestine. To perform this operation, (which is still more simple than that above the pubes,) to advantage, the patient should be placed in the position for lithotomy, and the fore-finger of the left hand carried up the rectum, as a guide to the trocar, which is held in the right hand, introduced into the rectum, and made to perforate the anterior part of that intestine, at its centre, immediately above the prostate. The stilet being withdrawn, and the urine evacuated, the cannula is plugged, and secured in its situation by tapes. The patient's bowels should afterwards be kept in a soluble state, to prevent the cannula from being disturbed during an evacuation of the fæces. After the natural route through the urethra is restored, the cannula may be withdrawn, and the opening in the rectum allowed to heal. Whether the operation of puncturing the bladder be performed above the pubes, or through the rectum, it is very important that it should not be delayed beyond the *third* or *fourth* day; for it has been found by experience, that after this period the case has usually terminated fatally.

SECTION V.

INCONTINENCE OF URINE.

Incontinence of urine is the reverse of retention. There are two or three varieties of the disease. Sometimes the urine passes off by the urethra as soon as it is secreted; at other times the patient can retain it for a certain period, and is then obliged suddenly to evacuate. In a third variety of the complaint the discharge generally takes place during sleep. This is commonly confined to young children, while the other varieties are chiefly met with in adults, and are dependent, for the most part, upon general or local paralysis, general debility, injuries, malformation of the urinary organs, hemorrhoids, stone in the bladder, &c. Incontinence in *old* people is much less common than imagined, the disease, as formerly remarked, being in them, really *retention* of urine—a fact which should never for a moment be forgotten by the young surgeon.

TREATMENT OF INCONTINENCE OF URINE.

For incontinence of urine, when it occurs in adults and depends upon local or general debility, the internal use of cantharides, muriated tincture of iron, bark, and opium, conjoined with the cold bath and blisters to the sacrum, will sometimes effect a cure. But when the disease, from constitutional or local infirmity, is incurable, or not susceptible of relief from medicine, well-contrived instruments are capable of obviating many of the unpleasant inconveniences to which the patients are liable. In particular, gum elastic vessels, moulded to the shape of the thigh and genitals, and suspended by tapes passed around the pelvis, often answer an excellent purpose by receiving the urine, as it dribbles away, while the patient is walking about. Some of these instruments, however, are so very clumsy as to annoy the patient by their conspicuousness,

or from the material of which they are made retaining and giving out an unpleasant odour. Latterly considerable improvements have been made in the manufacture of them. " I was lately consulted," says Professor Cooper, " by a gentleman who showed me an admirable invention for the reception of his urine, which had been passing from him involuntarily for some years: it consisted of a waterproof oil-silk tube, about two inches and a half in diameter, extending from the penis down the thigh and leg, under his trousers, without causing any visible bulging or disfigurement. It would serve for four or five hours at a time, and enabled this individual to mix with society. The machine was made by a German residing in Princes Street, Drury Lane."

That variety of incontinence peculiar to children, gradually subsides, spontaneously, as they advance in age. Parents and children themselves, to guard against this infirmity, have sometimes, most improperly, applied ligatures to the penis over night. From this practice I have seen numerous instances of ulceration of the urethra, or of sloughing of the penis, at the part embraced by the ligature. Within the last four months, a case was sent to me by my friend Dr. Brown, an eminent physician of Fredericksburgh, Virginia, where a fine lad of fourteen had destroyed the urethra within an inch and a half of the extremity of the glans penis by the application of a ligature. It is almost impossible, in such cases, to restore the continuity of the urethra by caustic, incisions, or the introduction of gum elastic tubes—inasmuch as the remnant of urethra next the glans is apt to ulcerate through from the wearing of instruments. Such operations, however, should be attempted.

SECTION VI.

SENSITIVE TUMOURS OF THE FEMALE URETHRA.

This disease has been considered by surgeons comparatively rare.   In all probability, however, it is more common than imagined, owing to females, from natural delicacy, concealing it as long as possible, and in some instances, there is reason to believe, never revealing their situation at all.   Twenty-five years ago, I attended a widow lady of great respectability, who for a long time had suffered from a tumour of the urethra about the size and appearance of a strawberry, which filled up the urethra and was so exquisitely sensible, and attended with such extraordinary pruritus, as nearly to drive her to desperation.   Finding her health declining, and alarmed at the repeated hemorrhages which had lately occurred, she consented to an operation; but although I dissected out the tumour again and again, no benefit resulted, and as at each operation the hemorrhage was alarming, and required to be stopped by caustic, and upon one occasion by the actual cautery, I declined attempting more for her relief. She afterwards removed to a distance, and with the result I am unacquainted.   Since that period I have met the disease occasionally, both in private and hospital practice, and in patients of all ages.   In the Philadelphia Hospital, ten years ago, I had a patient, a single woman, fifty years of age, who suffered intensely from a small tumour of this description, but who never obtained perfect relief from any mode of treatment employed.   Last summer I was consulted by Dr. Peachy Harrison, an eminent physician of Harrisonburgh, Virginia, in the case of a young woman similarly situated and in whom he had tried, without effect, all the usual means.   Supposing from these, and other circumstances, the disease to be incurable, I should not have drawn the attention of the profession to it, but for a communication recently made on the subject by my friend Dr. Alexander E. Hosack, of New York—son of the late distinguished Pro-

fessor Hosack, of that city—a gentleman well versed in all the departments of his profession, but particularly skilful in the treatment of surgical diseases, and in the invention and adaptation of ingenious contrivances for their removal or relief. This communication will be found in the first volume of the New York Journal of Medicine and Surgery, and in consideration of the value of its practical bearing, and the successful results attending the operations referred to, I shall give it entire in this place.

TREATMENT OF SENSITIVE TUMOURS OF THE FEMALE URETHRA.

" In May, 1835, I was consulted," says Dr. Hosack, " by a servant woman in a family where I was in attendance, for a complaint which she said had caused her considerable distress, and, as she expressed herself, it appeared as if something had dropped into the passage immediately after making water, causing her great pain at the moment, and which frequently bled, particularly upon being touched by her linen. Upon the slightest exertion she was seized with bearing-down pains to such a degree as to compel her to take to her bed. These difficulties, she said, had been gradually increasing upon her for two or three years, and being unmarried, she was from delicacy induced to conceal her sufferings until no longer able to bear them.

" From this statement I was induced to make an examination, which clearly explained the cause of all her trouble. I discovered two or three little tumours immediately within the meatus urinarius, to which they were attached by a narrow neck. They were of a florid red colour, and appeared to be covered by the delicate lining membrane of the urethra. They were exquisitely sensitive and bled upon the slightest touch. In form they resembled a split pea, varying from that in size to a small kidney-bean, and placed upright, in such a manner, as to break the flow of urine. The patient did not, however, complain of the the pain upon urinating as her greatest distress, for it was not to be compared to that caused by exertion, or from contact of the dress, which was frequently excruciating.

" By raising these tumours with a probe, I discovered their attachment to be limited to the margin of the urethra, and sug-

gested to her the propriety of having them removed, which I assured her could be readily done, and with comparatively little pain.   Having obtained her consent, I snipped them off with scissors: the hemorrhage was not excessive.   In a few days the part was healed and she appeared to be completely rid of the evil, until about six weeks after, when the sensitiveness and other symptoms returned.   In the course of three months I was again requested to relieve her if possible by a further operation. Upon examination, I found the margin of the urethra fringed with the same highly organized structure.   It appeared as if the lining membrane had been prolapsed, and was turgid with blood; or in other words, had shot out like a fungus.   Under these circumstances I determined to remove the diseased structure by excising the meatus urinarius, and this was accordingly done.   The wound in due time was healed, leaving the parts apparently sound, with the exception of a few spots of discoloration in the folds of the nymphæ, which I afterwards destroyed by caustic.

" The extremity of the urethra remaining somewhat harder than might have been expected in sound parts, I expressed doubt whether it might not be the incipient stage of scirrhus.   The disease, however, in the course of a few months returned with all the distressing symptoms as before enumerated.   The patient being again willing to submit to any operation that I might advise, I determined to remove the urethra to an extent that would hold out a better prospect of success.   My friend, Dr. Wilkes, with whom I consulted, confirmed this opinion, and assisted me in the operation.

" The patient being placed upon the bed in a recumbent position, with the legs flexed upon the body, I began with measuring the length of the urethra, by introducing the female catheter, and marking it the instant the urine began to flow; this precaution I considered necessary, from the fact that the length of the urethra, in females, is very variable; at the same time, I was unwilling to encroach too much upon the bladder, which might endanger consequences more distressing to the individual than the existing disease.

" The preliminaries being attended to, I seized the fungous excrescence with the *pince of Museux*, and drawing it out, I circumscribed the urethra with a knife, carried on the dissec-

tion until I had detached about three-quarters of an inch in extent, as I supposed. I then examined the urethra at the upper extremity of the wound, and finding it perfectly natural and free from all hardness, I separated it at that point. The hemorrhage for the moment was very great; but by pressure, constantly kept up with a compressed sponge, it was arrested, or so much restrained, as to do away with all anxiety on that account.

" The patient having made water a short time previous to the operation, I did not consider it necessary to leave a catheter in the bladder, which I afterwards regretted, as I was obliged to draw off the urine the following morning, but not without considerable difficulty, as may be imagined. I determined, however, for the future, to leave the catheter in the bladder, or at least until the urine should flow at its side; which took place on the sixth day, when I removed the instrument. Since which time, she has enjoyed full control over that organ, and voids urine with comparative ease.

" It is now six months, and no return of the disease. No bougie was introduced to keep open the mouth of the urethra, as might, *a priori*, have been considered necessary. Indeed, I purposely avoided using it, lest the irritation might predispose the parts to a return of the disease. Upon examining the part removed, I found the urethra to be very much thickened and hardened at its extremity, but this circumstance not being observed in other instances of this disease as related by different authors, I must conclude that it had no agency in the growth of these tumours, but was probably the result of irritation.

" I first met with this disease, in the practice of my friend, Dr. Mott, who, several years ago, was consulted by a gentleman on account of his daughter, who laboured under this distressing complaint. The case was one of great interest, both from the circumstance of the patient being at the delicate age of eighteen, and on the eve of marriage. She had suffered from this disease for two years and upwards, and considering it an insurmountable objection to marrying, had frequently deferred the nuptial ceremonies, at the same time not willing to break off her engagement, and unable any longer to conceal her actual situation, she disclosed the true cause to her father, the only surviving parent, who immediately came to New York, and placed her under the care of Dr. Mott.

" In this case, Dr. Mott, after carefully examining the disease, determined upon removing the *meatus urinarius*, to the margin of which two or three small flattened and vascular tumours were attached.   They were of the size of small beans, highly florid, and exquisitely sensitive.   The wound healed kindly after the operation ; the result was perfectly successful, when she returned home to her friends, and afterwards married.

" Although this disease is one of comparatively rare occurrence, much has been written upon it ; still, elaborate works on surgery and midwifery, have not, with but one or two exceptions, in any way noticed its existence.   I confess it appeared to me to be quite a novelty ; and as regards the excising of part of the female urethra for its removal, or for any other object, I do not recollect ever to have heard of a single instance ; nor have I yet been able to discover that it has been done to any extent, beyond the mere margin of the external orifice of the urethra. This disease is first spoken of by Morgagni, who, under the head of excrescences and other diseases of the female urethra, remarks : ' examining the body of an old woman about the beginning of 1751, I met with a small triangular excrescence within the external orifice of the urethra, but it was not prominent ;' and in another part of the same chapter, he goes on to state, ' that there is a red and fungous excrescence, which is of the size of a bean, sometimes to be observed attached to the orifice of the urethra.'

" This disease is also described by an Englishman by the name of Hughes, of Stroudwater, in Gloucestershire, in 1769.   In a case described by that gentleman, he speaks of it as of ' a red colour, and of a softish, spongy texture, with an irregular, jagged surface ; was sore when touched ; and a bloody serum oozed from it.'   The patient was eleven years of age, and of a very thin habit of body ; it had existed for three years.   In this case, Mr. H. removed the *Meatus Urinarius*, which completely included the disease.   The patient suffered for some time from retention of urine : only, however, during the healing process. Five years had elapsed since the operation, and the patient continued perfectly well.

" On examining the fungus, after the operation, it appeared about the size of the nipple of an adult ; its anterior part, being expanded, formed, as it were, a little cup, with its border indented

like a cock's comb, having a hole in its bottom which was the orifice of the urethra, which ran through the body of the fungus; the internal membrane of the urethra was continued to the edge of the indented border, which was of a deeper red colour and softer texture than the other part of it."

" In volume xiii. page 784, of the Lancet, Mr. Wardrop has published four cases of this disease. The first was in a young girl thirteen years of age ; the second in a lady of thirty years of age; the age of the third is not given ; the fourth was upwards of sixty years old. In all of these cases Mr. Wardrop speaks of the exquisite sensitiveness as the most prominent symptom. In one of the cases above alluded to, the disease returned after marriage, when the patient again applied to Mr. W. for relief.

" He states ' that the tumour had now assumed the appearance of a bright scarlet fungus, encircling the meatus, and was attended with such exquisite tenderness as to prevent sexual intercourse. The orifice including the disease was removed, and it did not return.'

" Boyer makes mention of a fungus occurring in the female urethra. It is however noticed in a more particular manner by Bromfield, and according to Mr. Hughes, accounts are also given of it by Sharp, Warner, and Jenner. Mr. Wardrop also refers to Chaussier and Dubois, and states that it is particularly noticed by Madame Lachapelle as well as by Rosenmuller, Vogel, Kaldibrand, Prochaska, and some other German pathologists.

" In many of the instances referred to by the older writers, the symptoms were at first mistaken for those of stone in the bladder, and in the case just related by Mr. Hughes, the disease was mistaken by those who were first consulted for prolapsus of the uterus, and actually treated as such, nor was the error discovered until the patient was unable any longer to bear the pain consequent upon the pressure applied to that viscus.

" By reference to the foregoing cases we arrive at the following conclusions:—

" 1st. That the disease is characterized by peculiar symptoms.

" 2d. That it is not confined to any age.

" 3d. That it is unaccompanied with discharge, unless the parts be chafed or abraded.

" 4th. That, in order to prevent a return of the disease, it is better to remove, at once, the external orifice of the urethra, including the tumours.

" 5th. That it is a complaint of slow growth, and does not attain to any great size ; for, in no instance yet recorded, so far as I am enabled to learn, has it been found larger than a small cherry."

Upon the whole, as regards the diseases of the urethra,—particularly stricture,—I may state, that more skill, judgment, and experience are required than for almost any other affection in surgery ; that, unfortunately, these diseases are, too often, placed in the hands of young and inexperienced practitioners, who are more prone to regard cutting or piercing instruments as the only alternative, and bold and decisive measures, as stronger proofs of talent and knowledge, than the slow and cautious proceedings of those, who, taught by the result of unfortunate cases, are constantly in dread, and with good reason, of similar terminations. I have heard the late Dr. Physick aver that he never approached a diseased urethra, especially in old and irritable subjects, without trembling and anxiety, and that there were very few whom he would trust with the management of such complaints. My own experience confirms, to the fullest extent, his statement.

On Diseases of the Urethra and Prostate Gland, consult Hunter on the Venereal ; Home on the Treatment of Strictures of the Urethra and Æsophagus, vol. iii. 4th edit.; Whateley's Improved Method of Treating Strictures of the Urethra ; 2d edit.; Letters concerning the Diseases of the Urethra, by Charles Bell ; Principles of Surgery, by John Bell, vol. ii. p. 209 ; Howship's Practical Observations on Diseases of the Urinary Organs, 1816 ; Wilson's Lectures on the Structure and Physiology of the Male Urinary and Genital Organs, and their Diseases, 1821 ; Desault's Works, by Smith ; C. Bell's Surgical Observations, p. 86 ; C. Bell on the Diseases of the Urethra, &c. by J. Shaw ; Bingham on Strictures of the Urethra, 1821 ; Home on the Treatment of Diseases of the Prostate Gland ; Hey's Practical Observations in Surgery, article Retention of Urine, p. 388, 3d edit.; Dorsey's Surgery, vol. ii.; C. Bell's Operative Surgery, vol. i.; Colles's Surgical Anatomy, p. 159, article Passing the Catheter ; Abernethy on the Operation of Puncturing the Bladder, in Surgical Works, vol. ii. p. 189 ; Cooper's First Lines, vol. ii. p. 215 ; Practical Observations on Strangulated Hernia, and some of the Diseases of the Urinary Organs, by Joseph Parrish, M. D., Philadelphia, 1836.

Most calculous concretions are formed originally in the kidneys, and thence find their way, along the ureters, to the bladder, and when too large to pass off with the urine, remain in that viscus and serve as nuclei for other sabulous depositions. But any extraneous body, accidentally lodged in the bladder, may lay the foundation of a stone. A drop of blood, a portion of inspissated mucus, a pin, a piece of bougie or catheter, a musket-ball, has often produced the disease. Many years ago, I operated on a boy four years old, and took from his bladder a stone, as large as a pullet's egg, in the centre of which was found the greater part of a needle.

Urinary calculi vary exceedingly in form, size, colour, consistence, and chemical composition. Some are very rough on the surface, others perfectly smooth; in shape most of them are oval, a few quite round, whilst others are oblong or angular. The difference in magnitude is not less remarkable—being met with from the size of a pea to that of a cocoa-nut. Calculi differ from each other in colour as much as in size and form; the most common variety is generally of a yellowish brown tint; some are nearly as white as chalk, and others, again, red or of a deep chocolate brown. In consistence, also, there is the utmost variation; for, at the slightest touch some crumble into dust, whilst others almost resist the stroke of a hammer. Scheele and Wollaston were among the first to investigate the chemical composition of urinary calculi, and their discoveries have led others to pursue the same path. According to the latest and best writers, these substances are found to consist of the following materials: 1st, of the lithic acid; 2d, of the lithate of ammonia; 3d, of the phosphate of magnesia and ammonia; 4th, of the phosphate of lime; 5th, of the oxalate of lime; 6th, of the triple phosphate of magnesia, ammonia and phosphate of

lime; 7th, of the carbonate of lime. Of these the lithic acid calculi are by far the most numerous. A very uncommon variety of calculus has been met with in this country, consisting of sabulous matter and *hair*, and resembling, closely, common plastering mortar. Only two instances of the kind have come to my knowledge. The first occurred about five years ago, in the practice of Dr. Physick, and the second, within the same period, in that of my friend, Dr. Lemoyne, an eminent physician, of Washington County, Pennsylvania. In both patients, the formation of this material was progressive, or kept up for months together.

Urinary calculi may be contained in the kidney, ureter, bladder, prostate gland, or urethra; but the bladder is their most common receptacle. Generally they lie loose within the cavity of that viscus, and at its most depending part. Sometimes they are contained in *cysts*, formed between the coats of the bladder, at the termination of the ureters, or between the folds of a contracted bladder; at other times they are fixed upon a fungous excrescence, the granulations from which shoot into the interstices of a rough stone, and hold it fast. The bladder may contain a single stone or a great number. Fifty-five were found in the bladder of the celebrated Buffon after death. Two hundred were taken by Desault from the bladder of a priest. Sir Astley Cooper states that the greatest number he ever extracted, was one hundred and forty-two. Boerhaave and Beauchene, each record an instance of three hundred and upwards taken from different patients. Murat met with six hundred and seventy-eight. But the largest number ever removed, probably, from the human bladder, was taken by Dr. Physick, ten years since, from the late Chief Justice Marshall. More than one thousand, varying from the size of a partridge-shot to that of a bean, were counted, and many others were lost. They were all of an oval shape, and upon the end of each I examined, as it came out of the wound, there was a black spot of the size of a pin's head. Notwithstanding the frequent introduction of the forceps and scoop, the patient recovered, perfectly, in a short time. When numerous, they are generally smooth upon their surface, and sometimes, in particular places, highly polished from continued friction upon each other. In many persons there is extraordinary tendency to calculus; so much so that it may be

said to prevail in many families. A remarkable instance of the kind has been recorded in the twentieth volume of the Boston Medical and Surgical Journal by my friend, Dr. Sewall, an eminent physician of Washington.

The *symptoms* of stone must depend, in a great measure, upon the particular situation it happens to occupy. When detained in the pelvis or infundibulum of the *kidney*, the concretion sometimes attains a large size, without subjecting the patient to much pain or inconvenience; on the other hand, its presence is occasionally productive of so much irritation as to excite suppuration of that gland. During the passage of a calculus along the ureter, the patient suffers, in most instances, excruciating pain, has frequent desire to make water, and can pass only a few drops at a time, and those very high-coloured and sometimes mixed with blood. So severe is the pain, in some cases, that the patient finds it impossible to leave his bed, and is obliged, in order to obtain temporary relief, to bend himself almost double. Fever, eructation, nausea, vomiting, and spasmodic retraction of the testicle, are common accompaniments of the disease. As soon as the stone drops into the bladder, the symptoms subside. Sometimes, however, the patient becomes easy for a few hours, even before the stone leaves the ureter, and then has a relapse. This may occur repeatedly.

An *encysted* stone, so long as it continues encysted, seldom gives rise to any severe symptoms; but a stone that lies loose in the bladder, and is liable to move about, must always excite more or less uneasiness, whether it be rough or smooth, large or small. One of the first symptoms of stone in the bladder, is a frequent desire to pass urine, and severe pain upon voiding the last drops of it. About the same period, also, the patient complains of an itching at the glans penis, to relieve which he soon gets into the habit of pulling or elongating the prepuce. Another symptom is the sudden stoppage of the urine while passing in a full stream. This arises from the stone being carried, by the contraction of the bladder, or by the stream of urine, to the neck of the bladder, where it blocks up the inner orifice of the urethra; in proof of which, if the patient lie down or change his position, the water flows again. After these symptoms have continued for some time, the patient becomes troubled with tenesmus and prolapsus ani, induced by the constant straining

and efforts to empty the bladder. When the stone is rough on its surface, there is often a good deal of fetid mucus discharged along with the urine, which is now and then mixed with blood. Sometimes the patient is very sensible, when he turns upon his side, or suddenly changes his position, of something rolling in his bladder. The same sensation is experienced whilst on horseback, or in a carriage. Under the sufferings occasioned by the symptoms enumerated, the patient may live for a great number of years. Gradually however, his health declines, the bladder contracts to a very small size, becomes thickened and diseased, and at last death takes place from long-continued irritation and derangement of most of the bodily functions.

When the *prostate gland* contains a number of stones, it may be possible to feel them through the coats of the rectum, by passing the finger within the gut. Dr. Marcet mentions a case in which Sir Astley Cooper was able, by this expedient, to detect a number of calculi moving in a cyst within the prostate, and to hear a distinct clashing as their surfaces were pressed together.* Calculi, when detained in the *urethra*, generally stop behind the bulb, or at the external orifice of the passage. From being pressed upon by the stream of urine, they are sometimes imbedded in the substance of the penis, and afterwards do not obstruct the urethra. At other times they find their way out, by exciting ulceration of the urethra, and produce a *spontaneous* cure. Cases of the kind have been reported by Crosse and others. I have known them, in a similar way, to be discharged from the *bladder ;* and one instance of the sort was mentioned to me lately by Dr. Jackson, formerly of Northumberland, but now an eminent physician of Philadelphia.

The *causes* of the formation of urinary calculi, although frequent attempts have been made to investigate them, have never been unravelled. We know, indeed, little beyond this,— that the disease prevails in certain countries and districts, more than in others, and that in some climates, especially very warm ones, it is seldom met with. Throughout the United States, which embrace a very extensive tract of country, fugitive cases may be every where seen ; but, upon the whole, the complaint must be considered by no means common, if we except some

* Marcet on Calculous Disorders, p. 19.

portions of the western country, especially Kentucky, Alabama and Tennessee, where it is exceedingly frequent, and usually attributed, though, perhaps, erroneously, to the use of lime-stone water. That the complaint, however, is connected, more or less, with dyspeptic depravities, atmospheric changes, and peculiar diathesis, there can be very little doubt. Hence it has been commonly met with in cold, moist and variable climates, and in families peculiarly subject to disorder of the digestive functions. Formerly it was supposed to be unknown in very warm climates. But this has recently been proved to be a mistake—by Burnard, Brett, Spry, Turner and Lindsay, who report numerous operations as having been performed on adults and children, in Bengal and India.*

TREATMENT OF URINARY CALCULUS.

When a patient is suffering from a fit of the gravel, as it is usually called, or in other words, from the passage of a calculus along the ureter, the most decisive treatment must be at once adopted. If robust and vigorous, several ounces of blood may be taken from the arm, and a brisk purge administered immediately afterwards. These should be followed by immersion of the whole body in a warm bath. If, by these means, the pain is not diminished, ten or fifteen drops of spirits of turpentine may be given, three or four times a day. This remedy has been used by Dr. Physick, for many years, with the greatest success. A combination of turpentine and opium, according to Dr. Marcet, was formerly employed as a quack medicine, in England, with great benefit in this complaint. By my friend Dr. Samuel Betton, a distinguished practitioner of Germantown, I am informed, that he has frequently employed, with the most decided benefit, pills of the inspissated *Venice turpentine*, to the extent of half a dram in twenty-four hours, and that some of the patients have taken the medicine for weeks before an expected attack, and have thus guarded against it. By the advice of Dr. Physick, I prescribed, some years ago, the tincture of phytolacca—poke-

* See Transactions of the Medical Society of Calcutta, and Crosse on Urinary Calculus.

berry—in an obstinate case of lithiasis, and with the most decided relief to the patient. It should be administered in doses of a dessertspoonful two or three times a day. Sometimes I have known the patient much relieved by suddenly throwing up the rectum a stimulating enema. Opiate injections, also, in some cases, prove highly beneficial, as well as opium internally.

The existence of a stone in the bladder, can only be determined positively by *sounding*. This preliminary operation should, therefore, always be performed before the surgeon enters upon the treatment of the disease. By sounding is meant the introduction of a steel instrument,* resembling a catheter,—but solid instead of hollow,—into the bladder. The rules formerly pointed out for the management of that instrument, in cases of retention of urine, should also be observed in the introduction of the sound. Very often the stone cannot be felt, in consequence of its lodging in a depending part of the bladder, below the reach of the instrument. In such cases the finger is put into the rectum and the lower part of the bladder pressed upwards, and the stone being carried by this manœuvre along with it, rubs against the instrument. Or, the urine may be permitted to accumulate in large quantity, and the walls of the bladder being then distended, the stone will be raised from its lurking-place and touched by the sound. But this expedient sometimes fails : in that event, the practice first pointed out by Dr. Physick should be pursued—by placing the patient " nearly on his head," so as to render the fundus of the bladder the lowest part, and thus bring the stone in contact with the point of the sound. The surgeon should take care not to mistake a stone in the urethra, or prostate gland, for one in the bladder. He must particularly remember, moreover, never to sound a patient during a fit of the stone, or immediately after his arrival from a journey. Patients have been often injured, likewise, by unnecessary and harsh attempts at sounding. Having ascertained that the bladder contains a stone, its removal should next be determined upon. But, before this is resorted to, the surgeon must endeavour to mitigate the symptoms as much as possible,

* The handle of a sound should always be smooth, in order that the slightest sensation may be detected by the touch of the surgeon.

or, in other words, to prepare the patient for the operation. Formerly, many attempts were made to destroy a stone, either by the use of internal medicines, or by the injection of fluids into the bladder. The practice, however, has long been abandoned —having been found ineffectual. But in another point of view it has proved highly useful—by relieving the symptoms, and thereby rendering the patient's chance of recovery after an operation more certain. The best medicines, for this purpose, in most cases, are the alkalies, especially in the form of soda-water, or the carbonate of soda. Magnesia, also, has often proved very serviceable. Together with this treatment, the patient should be obliged, for two or three weeks before the operation, to live on a low diet, and take occasional purgatives. The operation should not, if it can be avoided, be performed during very warm, or very cold weather. A few hours previous to the operation, the rectum should be emptied by an enema, the perineum shaved and a tape tied round the patient's penis to prevent him from making water. The latter is so important, that to insure its observance, a careful attendant should watch the patient from the time the penis is tied, until the operation. Various modes of performing lithotomy have been practised from time immemorial; but it is merely my intention to describe the lateral operation as it is performed at the present day by the most eminent surgeons—with the *gorget*, and to notice briefly the high operation, and that upon females.

The *instruments* are two or three scalpels, a curved probe-pointed bistoury, a straight sharp-pointed bistoury, a staff with a large, deep groove, Physick's gorget,* several forceps, smaller than they are usually made, a scoop, tenacula, ligatures, sponges, a curved needle and forceps for the pudic artery, a large pewter injecting syringe with a pipe six inches long, tepid barley-water carefully strained, strong bands of woollen or muslin, two inches broad and three or four yards long, and a bowl of warm oil.

A narrow dining-table is selected and the leaves turned down. Over the table is placed a thick blanket, several times folded.

* This instrument differs from the common gorget in having a moveable blade, or one that can be separated from the back, for the purpose of sharpening it to greater advantage. For a particular description of it, see Dorsey's Surgery, vol. ii.

On this the patient, dressed merely in a shirt and loose night-gown, is laid—with a pillow under his head, his pelvis resting on the lower edge of the table, and his legs and thighs supported by an assistant on each side. The surgeon unties the penis, dips his staff in warm oil, introduces it into the bladder, and having satisfied himself, and the other medical attendants, of the presence of a stone, gives the staff to a third assistant, with an injunction not to let its point slip from the bladder. He then passes each wrist through loops formed at the extremities of the bands or fillets, directs the patient to grasp the soles of his feet, and fastens them and the hands together by numerous turns of the bandage. The assistant, holding the staff steadily with one hand, and standing on the side of the patient, is then directed to raise and support the scrotum and testicles with the other hand—taking especial care that the end of the staff is fairly within the bladder. The assistants, appointed to secure the patient's limbs, must each place a knee in their arm-pit, grasp a foot with their hands, and sustain the thighs nearly in a perpendicular position, separating them, at the same time, moderately. The surgeon then seats himself before the patient on a low stool, (having previously arranged his instruments in the order he will require them, on a small table placed within his reach,) takes a scalpel of moderate size, makes an incision in the left side of the perineum, commencing a little below the arch of the pubes, extending downwards with a slight obliquity, between the rectum and tuberosity of the ischium, and terminating opposite the lower margin of the anus. This first cut is made, not with the point of the knife, but with its convex edge, through the integuments, fat, and perinæal fascia. By repeated strokes of the knife, the transversales muscles are next unbridled, and the membranous part of the urethra and prostate gland laid bare. At this stage of the dissection, the operator will sometimes find it necessary to stop and take up the transversalis perinæi artery.* The membranous part of the urethra and staff being distinctly felt by the fore-finger of the left hand, the surgeon next takes the *sharp-pointed* bistoury, carries it to the bottom of the wound, with its back towards the rectum, and opens the membranous part of the urethra, to the extent of half

* Usually this vessel does not require the ligature.

an inch or more, by cutting from behind forwards, or from the
prostate towards the bulb. As soon as the urethra is opened,
a stream of urine, (provided the patient has retained it,) issues
through the wound. Without loss of time the surgeon next
lifts the gorget, fixes its beak in the groove of the staff, takes
the handle of the staff from the assistant, depresses it, balances
for a moment the two instruments on each other, runs the beak
of the gorget backwards and forwards, two or three times, to
be certain that it is fairly in the gutter of the staff, then with a
slow but steady and decided movement carries the instrument
onwards to the bladder through the prostate gland. A sudden
gush of urine announces the completion of this stage of the
operation. The gorget being withdrawn, the left fore-finger
of the operator is immediately introduced, the stone felt, and
the staff taken away. Still keeping the finger in the bladder,
the surgeon then takes a small pair of forceps, and with
the blades shut, carries the instrument through the opening in
the prostate, alongside the finger, touches the stone, removes
the finger, expands the blades of the forceps, seizes the stone,
—gently, lest it break,—parallel, if possible, with its longest
diameter, and gradually extracts it. As soon as it is removed,
an accurate examination should be instituted, in order to dis-
cover whether there be any other stones left behind. If so,
the forceps must be again and again introduced, until the whole
are extracted. To clear the bladder of any fragments, sand, or
clotted blood, that may happen to remain, the pipe of the syringe
should be introduced, and a quantity of tepid barley-water
thrown in, repeatedly, until the bladder is completely rinsed out.
Any vessel of importance, that may happen to have been cut will
probably continue to bleed after the stone has been extracted,
and should be secured by ligature without delay. If the pudic
artery is divided by the knife or gorget, it will pour out blood
copiously, and from this cause many patients have lost their
lives. The forceps and needle* used by Dr. Physick, for deep-
seated arteries, will be found the best instrument for taking it
up.† As soon as the hemorrhage has stopped, a gum elastic

* See vol. i. p. 64.
† It sometimes happens that after the stone has been removed, and the patient
put to bed, secondary hemorrhage takes place, and that the blood finds its way
into the bladder, where it excites so much irritation as to cause a contraction of

catheter, of large size, should be carried through the wound into the bladder, the bandage removed from the hands and feet, and the patient laid in bed on his left side—the thighs being lightly bound to each other, by two or three turns of the roller. The gum elastic catheter, projecting from the wound, serves to carry off the urine, which being received in a dish, the patient is kept constantly dry and comfortable. For several days the urine continues to pass by the perineum; at length, however, it is discharged through the penis, and very little runs through the wound. The catheter should then be removed, and, in a short time, the opening in the perineum will heal. In a few rare instances, indeed, the incisions have healed by the first intention; but in general, three or four weeks elapse before a cure is effected.

The operation of lithotomy, as I have described it, must be understood as adapted to the adult, and as calculated for cases unattended with difficulty. The same rules should be observed in performing the operation on infants and children—the instruments and incisions, in such cases, being proportionally smaller. In such subjects, moreover, the surgeon may expect to experience some trouble, from a frequent protrusion of the rectum, during the operation, inasmuch as most children afflicted with the stone, are subject to prolapsus ani. Upon the whole, however, the operation of lithotomy in children is, compared with that of the adult, attended with few difficulties.

To guard against accidents, and to prepare the young sur-

that viscus, and a sudden discharge of urine and coagulated blood through the wound. In fifteen or twenty minutes the same accumulation and expulsion again take place, and may continue until the patient is exhausted, unless the surgeon understands the nature of the accident and the mode of treating it. In all such cases, I have reason to believe, from what I have seen, that the hemorrhage proceeds from the venæ vesicales, or from some of the arteries above the prostate. Under these circumstances, a very ingenious mode of arresting the flow of blood was executed many years ago by the late Dr. Physick, (in the case of a Dr. B.) by introducing a large gum elastic catheter into the bladder through the urethra, and at the same time a long slip of lint through the wound, between the lips of the prostate, so as to keep them in accurate apposition. The flow of blood being thus stopped, and the urine passing off by the catheter, instead of flowing through the wound, it follows that the hemorrhage will not return, so long as the lint retains its position; it is important, therefore, that it should be left for several days, or until suppuration takes place. By adopting this plan I have saved the lives of two patients, who otherwise, I am sure, must have perished.

geon for difficulties, which at some period or other he may expect to encounter, the following mementos should be carefully attended to.

1st. To examine *minutely* every instrument, before it is used, especially the gorget and staff. If the cutting edge of the former be not extremely sharp, it will not divide the prostate gland, but, pushing it forward, will pass between the bladder and rectum, and deceive the surgeon, who, supposing that he has opened the bladder, thrusts the forceps into the wound, makes fruitless efforts to extract the stone, and, perhaps, may tear away, as has happened, the prostate and part of the bladder. If the gorget be not accurately fitted to the staff, it may be discovered during the operation,—and at the critical moment of pushing the instrument into the bladder,—that the beak is too large for the groove. Under these circumstances, should the operator persevere in his attempts to thrust the gorget home, great mischief may ensue. The *size* of the gorget must always be proportioned to the age and size of the patient. A gorget, for an adult, should never exceed in breadth three-quarters of an inch, and, for most patients, one five-eighths of an inch will answer. Children seldom require an instrument beyond three-eighths of an inch in width. An unusually wide gorget always endangers the pudic artery. The most experienced lithotomists, however, of modern times, have always inculcated, and, as I conceive, justly, a free incision of the prostate and neck of the bladder, rather than tear these parts in attempting to get out a large stone. How then can this be accomplished unless a *broad* gorget be employed? The answer is very easy. The chief object of the gorget is to make an opening into the bladder; if this opening is sufficiently large to admit the finger of the surgeon and enable him to touch the stone, this is all he can require. Finding, by the feel, the stone too large to come away through the track made by the gorget, the *curved probe-pointed bistoury* is at hand, and with this the wound may be instantly enlarged to the requisite extent, and without exposing the pudic artery. In running the gorget along the staff, through the prostate and bladder, care should be taken to *depress* its handle, in order that the blade may be sufficiently elevated to pass in a line corresponding with the axis of the pelvis. This the operator sometimes finds it difficult to accomplish, owing to the blade of the gorget being made as broad near

Plate VI. V.2.

¾ Size.
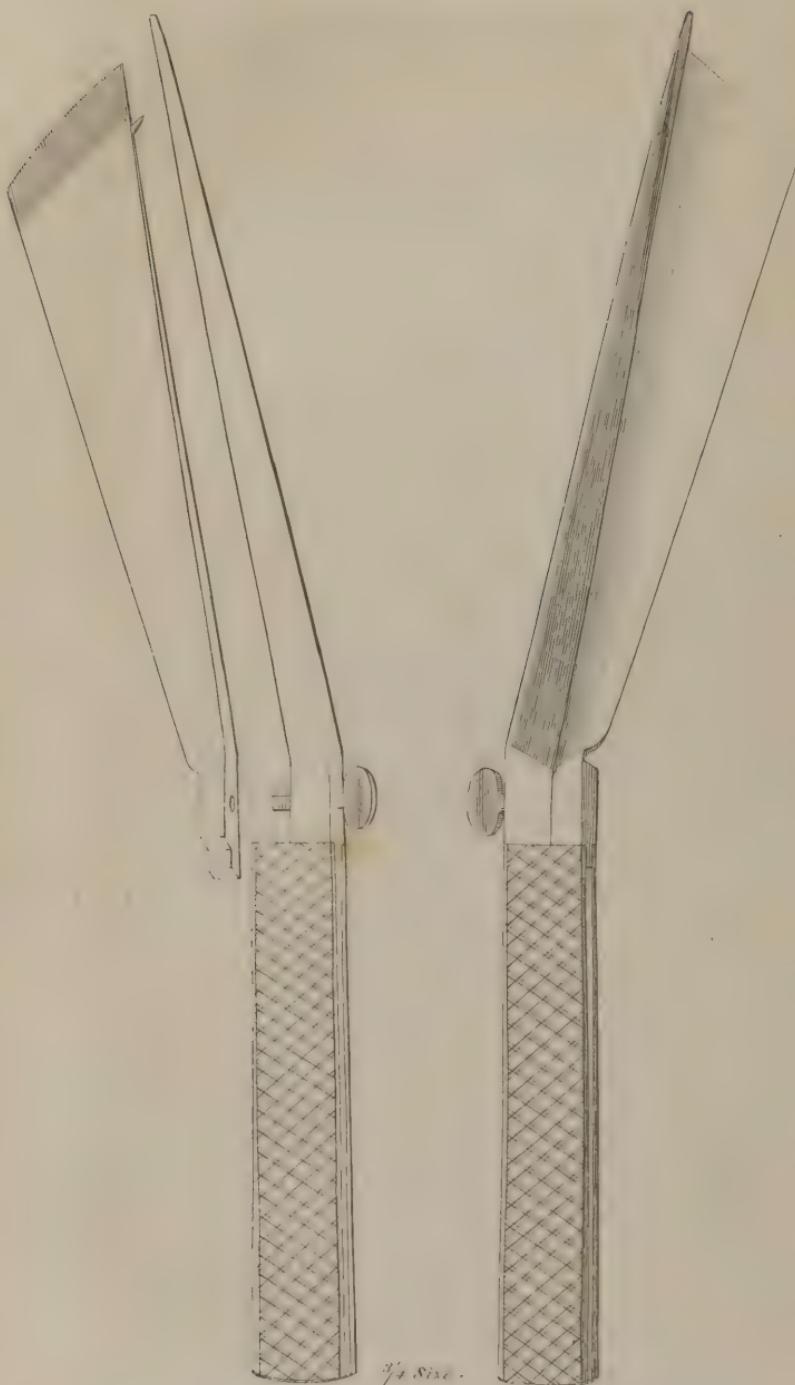
the handle of the instrument as at its point, and, on this account, not calculated to rest in the lower angle of the incision. To obviate this difficulty, I have, for several years past, had the blades of gorgets so constructed, as gradually to taper from the outer corner of the cutting edge to the handle of the instrument. (See Plate VI.)

2d. If the surgeon, from timidity, or any other cause, does not make his incisions in the perineum ample, but leaves some of the fibres of the transversales perinæi muscles uncut, he will find, in attempting to extract the stone, great resistance, and a constant tendency in it to slip from the grasp of the forceps. This resistance usually arises from the fibres of the transversalis perinæi alter. In such a case the fore-finger of the left hand should be carried towards the bottom of the wound to depress the rectum, while the remaining obstruction is removed by the knife. A wound of the rectum will not prove so serious an accident as some have represented; but, nevertheless, it should be carefully avoided.

3d. The lithotomy forceps are, in general, made unnecessarily large and clumsy; so large, indeed, as often of themselves to fill up the opening through the prostate. The teeth, too, on the inner surface of the blades, are often so large as to act like wedges, and break the stone the moment it is grasped. For a child, a forceps very little larger than the common pocket-case instrument, will serve a better purpose than the one usually employed; and the smallest forceps contained in the lithotomy case, provided the handles be somewhat lengthened, will answer for an adult.* If a stone should be so large as to require breaking, a strong pair of forceps, with a screw in the handles, will prove more effectual than the complicated instrument of Mr. Henry Earle. Although I have had occasion, however, to break large stones, I have never experienced any difficulty in effecting it with the common forceps, except in one instance. Frequently, a stone will break under very moderate pressure of the forceps, and when the surgeon is unwilling for it so to do. In this event, great patience and gentleness must be exercised in extracting the fragments by the scoop, and by injections of barley-water.

* The blades of stone forceps should never touch, but a small space be left between them, to prevent the bladder from being pinched.

It sometimes happens that one portion of a stone is imbedded in a cyst in the coats of the bladder, while the other projects into its cavity. This happened in a case upon which I operated at Alexandria, under the care of two distinguished physicians of that place—Drs. Washington and Sims. Having seized the stone with the forceps, the projecting half broke off, and the remainder, with great difficulty, I was obliged to scoop out of the cyst with my finger. The patient had long suffered from the disease, was greatly exhausted before the operation, and died ten or twelve days after it. Some years ago I operated on a young man in the Philadelphia Hospital, and took from his bladder a stone about the size of a walnut, and afterwards introduced my finger to ascertain if there were any others left, when, to my great surprise, I discovered that the fundus of the bladder, for a considerable extent, was incrusted with calculous matter, which I pealed off in successive layers, some of which were nearly half an inch thick. This patient perfectly recovered. Under circumstances such as I have detailed, the surgeon should never, for a moment lose his self-possession, but proceed cautiously and gently, but firmly, until he has effected his purpose. In the common operation of lithotomy, too, it should never be necessary to pull violently with the forceps, but the instrument must be humoured, and its position changed and twisted gently in a variety of directions.

4th. The *after treatment* of lithotomy is oftentimes more important than the operation itself; and the surgeon would do well never to operate, unless he could attend the patient throughout the whole course of his confinement. I have now performed the operation of lithotomy more than fifty times, and have lost out of that number, only six patients. My success I attribute, in a great measure, to ample incisions, and to extraordinary care during the after treatment. Three out of the six patients died at a distance where I could not attend them, and the other three were greatly exhausted by the disease before the operation was performed. Dr. Warren, the distinguished surgeon of Boston, has lost, as he informs me, but two patients out of seventeen. The shock communicated to the system by the severity of the operation, is sometimes such as greatly to endanger the patient's life, and, indeed, some have actually died on the table, or a few hours after—*reaction* having never been established.

Many years ago I lost a patient twelve hours after the opera-
tion, purely from this cause, and the same thing occurred to the
late Dr. Physick. So long as this state of the system continues,
stimulants, particularly ammonia, must be employed. After re-
action takes place, then inflammation must be guarded against,
and to prevent this, the antiphlogistic system, to the necessary
extent, will be naturally resorted to.

The *high operation* of lithotomy, or that above the pubes, an
account of which, it is said, was first given by Franco, in 1556,
was formerly much practised, particularly by Frere Côsme,
Douglass, and Chesselden. The unfortunate termination, how-
ever, of numerous cases, caused it to be abandoned almost en-
tirely. Still it has been revived at different periods, and latterly,
by Souberbielle, of Paris, and Carpue, and Sir Everard Home,
of London. But, even under the most favourable circumstances,
it is an operation greatly inferior to the lateral, and, indeed,
should only be practised, I conceive, in cases where the stone
is ascertained to be of extraordinary magnitude, or where the
prostate gland is very much enlarged. The principal objec-
tions to the operation arise from the difficulty of preventing the
escape of the urine into the cavity of the pelvis, and the danger
of wounding the peritoneum. If the operation be determined
on, I should prefer the mode of executing it devised by Sir Eve-
rard Home, and as described by him in the following case.

" An incision was made in the direction of the linea alba,
between the pyramidales muscles, beginning at the pubes, and
extending four inches in length : it was continued down to the
tendon. The linea alba was then pierced close to the pubes,
and divided by a probe-pointed bistoury to the extent of three
inches. The pyramidales muscles had a portion of their origin
at the symphysis pubis detached to make room. When the
finger was passed down under the linea alba, the fundus of the
bladder was felt covered with loose, fatty, cellular membrane.
A silver catheter, open at the end, was now passed along the
urethra into the bladder, and, when the point was felt by the
finger in the wound, pressing up the fundus, a stilet, that had
been concealed, was forced through the coats of the bladder,
and followed by the end of the catheter. The stilet was then
withdrawn, and the opening, through the fundus of the bladder,
enlarged towards the pubes, by a probe-pointed bistoury suffi-

ciently to admit two fingers, and then the catheter was with-
drawn. The fundus of the bladder was held up by one finger,
and the stone examined by the fore-finger of the right hand.
A pair of forceps, with a net attached, was passed down into
the bladder, and the stone directed into it by the finger : the
surface being very rough, the stone stuck upon the opening of
the forceps, and, being retained there by the finger, was ex-
tracted. A slip of linen had one end introduced into the blad-
der, and the other was left hanging out of the wound, the edges
of which were brought together by adhesive plaster. A flexi-
ble gum catheter, without the stilet, was passed into the bladder,
by the urethra, and kept there by an elastic retainer surround-
ing the penis. The patient was put to bed, and laid upon his
side, in which position the urine escaped freely through the
catheter."

Some years ago, I was called to Virginia, to operate for
lithotomy. I found the patient very far advanced in years, and
labouring not only under stone, but morbid enlargement of the
middle and lateral lobes of the prostate. Knowing the diffi-
culties I should have to contend with under these circumstances,
I determined, instead of performing the lateral operation, to
open the bladder above the pubes. Accordingly, assisted by
Drs. Withers and James, two eminent practitioners of the neigh-
bourhood in which the patient resided, I performed the opera-
tion after the manner of Sir Everard Home above described,
and succeeded without difficulty in removing two calculi. The
patient's chance of recovery, notwithstanding his age and the
enlargement of the prostate, was very favourable ; so much so,
that feeling himself, as he imagined, perfectly secure, and tired
of restraint and confinement to bed, he insisted upon the cathe-
ter being withdrawn,—contrary to very strict injunctions I had
left with him,—and in consequence soon after perished from
peritoneal inflammation induced by effusion of urine into the
cavity of the pelvis. This was the first instance, I believe, in
which the *high* operation had been performed in America. It
has since been done, successfully, by Dr. Carpenter, of Lancas-
ter, and also, as I understand, by Dr. Van Valzah, of Lewisburg,
Union County, Pennsylvania.

Females are subject to calculus as well as males, though the
disease in the former is by no means so frequent as in the latter

—owing to the female urethra being so short and large as readily to permit the escape of the calculous particles before they become so large as to form a stone. The *symptoms* created by the presence of a stone in the female bladder resemble those which have already been pointed out as characterizing the disease in males; in general, however, women suffer more than men from the disease.

There are two modes of extracting the stone from the female bladder—by *dilatation* of the meatus urinarius, and by *incision*. The former was often practised by the older surgeons, and within the last twenty or thirty years, has been occasionally resorted to. It should be preferred, in general, to the knife, (especially when the stone is small,) inasmuch as it is not so liable to be followed by *incontinence* of urine. A bit of compressed sponge, or wax bougies gradually increased in size, will answer very well to dilate the passage with. When the stone is found to be very large, it will, perhaps, become necessary to divide the urethra, and the best mode of performing the operation, is, I think, the following. The patient is placed in the ordinary position for lithotomy, and her hands secured to the feet by bandages. The surgeon then introduces into the urethra a straight staff, with its groove directed towards the left ischium, and holding it firmly by the handle, passes with the right hand a straight bistoury through the urethra and neck of the bladder, obliquely downwards. The finger being introduced and the stone felt, it may be readily removed with the straight or curved forceps. As incontinence of urine has followed in all the cases in which Sir Astley Cooper has performed or witnessed the operation, he has expressed his determination, in future, to try the effect of a suture upon the edges of the wound.

I have already remarked, that I had never failed, except in one instance, to break a stone with the common forceps. As that instance was an extraordinary one, and the mode of crushing the stone not less so, perhaps, I will relate the circumstances in concluding the subject of lithotomy. A man, named Davis, was lithotomized at Cincinnati, by the late Dr. Godman, who failed to extract the stone on account of its immense size. The wound healed up, and the man *walked* from Cincinnati to Carlisle, Pennsylvania, where he was subjected a *second* time to lithotomy by the late Dr. Given, and with similar result. He

then *walked* to Philadelphia, and placed himself under my care, in the Philadelphia Hospital. Assisted by Dr. Physick, I performed the operation, and finding the bladder filled with an enormous stone, I applied a *drill* half an inch wide, fixed in a handle, and made an opening sufficiently deep to introduce one blade of a forceps, while with the other, on the convex surface of the stone, sufficient pressure was made to quarry it in a short time completely. The patient recovered in two weeks, and *walked* home, as Dr. Chapman remarked, *a stone* lighter. The stone was soft and friable, or it could not have been thus disposed of.

Carpue's History of the High Operation, &c. 1819 ; Sanson des Moyens de Parvenir a la Vessie par le Rectum, 1817 ; Dictionnaire des Sciences Medicales, tom. xxviii. p. 422 ; Traité Historique et Dogmatique de l'Operation de la Taille, par J. F. L. Deschamps, Paris, 1796, 4 tomes, 8vo. ; John Bell's Principles of Surgery, vol. ii. part i.; Desault's Works, by Smith, vol. iii. ; C. Bell's Operative Surgery, vol. i. p. 329 ; Earle's Practical Observations on the Operation for the Stone, 1803 ; Roux's Journey to London ; Allen's Treatise on Lithotomy, 1808 ; Colles's Treatise on Surgical Anatomy, p. 145 and 169 ; Cooper's First Lines of the Practice of Surgery, vol. ii. p. 320, 4th edit.; Dorsey's Surgery, vol. ii. ; Dorsey's Inaugural Essay on the Lithontriptic Virtues of the Gastric Liquor, 1802 ; Marcet's Essay on the Chemical History and Medical Treatment of Calculous Disorders; Prout's Inquiry into the Nature and Treatment of Gravel, Calculus, &c.; Magendie on Gravel, &c.; Wilson on the Urinary and Genital Organs, London, 1821, 8vo; A Treatise on the Formation, Constituents, and Extraction of the Urinary Calculus, being the Essay for which the Jacksonian Prize for the Year 1833 was awarded by the Royal College of Surgeons in London, by John Green Crosse, Surgeon to the Norfolk and Norwich Hospital, and Lecturer on Clinical Surgery, Member of the Royal College of Surgeons, and Fellow of the Royal Medical and Chirurgical Society of London, Corresponding Member of the Société Médicale d'Emulation of Paris, formerly Demonstrator of Anatomy in the University of Dublin, Member of the American Philosophical Society of Philadelphia, &c. A work replete with every variety of information on the subject it treats; and, as coming from a surgeon of acknowledged ability, industry, zeal, and experience, should be carefully studied by all desirous of obtaining the best pathological and practical information on calculus and its treatment.

SECTION VIII.

LITHOTRITY.

AMONG the obsolete and musty records of ancient times, isolated scraps of valuable matter, plausible hints and speculations ingenious instruments and operations are met with as " rari nantes in gurgite vasto." By the industry, however, of such men as Ploucquet, Sprengel, Good, Young, S. Cooper, and a host of German labourers, the golden sand has long been washed and picked from the rubbish that surrounded it, and whether dug from the caverns of Pompeii or Herculaneum, or collected from the deserts of Egypt or Arabia, or scraped from the ruins of Greece, has been preserved pure and unalloyed, and stored up for its rightful owners. But how few and unmerited are the claims of the ancients to those treasures which have been so unsparingly showered for the last fifty years upon every department of the healing art. And yet no sooner is a discovery made, or a new idea started, or a new operation performed, but the claim to priority is contested by a bold assertion that Hippocrates, Galen, or Celsus, or some other antediluvian, is entitled to the honour of the claim in question. This disposition to detract from well-merited fame, every where so prevalent, and inherent, perhaps, in human nature, was strikingly displayed a few years since in France, in relation to the operation of *Lithotrity;* for when Civiale and Leroy, poor and obscure, but most meritorious and ingenious individuals, demonstrated that the stone could be destroyed in the human bladder, and removed, without the operation of lithotomy, it was immediately proclaimed that there was nothing new about the affair, that they deserved no credit for the operation ; for that a monk of Citeaux, and Martin, an English colonel, had both relieved themselves, long before, by nearly the same means ; that Gruitheisen, a Bavarian physician, had made similar experiments, and that even Ammon of Alexandria, Franco, Ambrose Parè, Hildanus,

Sanctorius, Germanus, and Haller, were acquainted with
lithotrity, that Amusat, and others, were all familiar, before
Civiale and Leroy, with the operation.

But, in answer to all this, it may be said, (admitting that some
obscure hints might have been thrown out, or nugatory experi-
ments made by the individuals mentioned, or others,) that no
brilliant discovery, or invention, ever was made, perhaps, that
had not been previously imagined or thought of by some one,
and that the men who, while struggling with poverty and almost
overwhelmed with difficulties of every description, have energy
enough to bear up and to persevere for years amidst privations
and sufferings, and, finally, to bring triumphantly their experi-
ments to successful issue, and adapt them to practice, are
entitled, fairly, to the chief glory of discoverers.   To whom but
Fulton are we really indebted for steam navigation? To whom
but Civiale and Leroy do we actually owe the operation of
lithotrity ? It is natural for us to look, in this age of project and
trickery, with distrust towards proposals not sanctioned by long
experience, and there were many, accordingly, disposed to
undervalue the labours of these men. For myself, I candidly
own, that for years I had no faith in the operation, as regards
the full advantage to be derived from it, and the facility of exe-
cuting it, and believed, with many others, that it was adapted
only to extraordinary cases. From the first, however, I never
hesitated to speak of it, both in this work and my lectures, as a
" most ingenious and beautiful idea," and to say, that the time
would probably come, when the operation would be so modified
and improved, as to deserve all the praises then so inconsiderately
lavished upon it. At the same time the young surgeon was
cautioned how he ventured to undertake the operation, (which
from trials made by some of the most skilful surgeons in this
country, was found to be extremely difficult, delicate and dan-
gerous,) under the idea, then too prevalent, that any one of
ordinary capacity and practice could perform it. That the
advice I then gave was just, and such as ought to have been
followed, experience has since proved ; for although there are
now many successful operators in Europe, and a few in this
country, every one of them, I am sure, will acknowledge that
lithotrity requires a tact, an attention to minute circumstances,
a discrimination rarely possessed, and, above all, *instruments*

which not one cutler in a thousand can manufacture. Upon the whole, then, it may be stated, that lithotrity has become an *established* operation, that it is adapted to a greater number of cases than was, originally, supposed possible, that in the hands of skilful operators it is generally successful, and that when the patients are healthy, middle-aged, or advanced in years, the urethra large and free from disease, the stone small and soft, and when females are the subjects of it, the operation should always be attempted in preference to *lithotomy.* On the other hand, it must be remarked, that it is seldom adapted to children, or to very irritable and diseased patients, or to cases where the stone is large and extremely hard, and that in Europe, and in this country, in the hands of the late Dr. Physick, Dr. J. K. Mitchell, and others, it has been followed by the most lamentable results.

Before describing lithotrity, it will be necessary to give an account of the instruments employed in the operation. I have already remarked that these are extremely difficult to make. Thoroughly convinced of this, I ordered a set from Paris, of the finest finish and construction, which, through the kindness of M. Civiale, were made under his own eye and direction, and every one examined by him and altered, until it met his approbation. Such of these, only, as are *essential* in the operation I shall describe in this place. There are many instruments invented by Heurteloup, Leroy, D'Etiolles and other lithotritists, that possess no advantages, I conceive, over Civiale's, and which, therefore, need not be noticed in a work of this description.

Civiale's apparatus, or lithontripteur, consists, 1st, of a silver cannula, eleven inches long, and from two to four lines in diameter, open at its lower extremity, and having at its upper a circular rim, connected with an oblong shoulder, intended to secure the cannula in a corresponding handle, or lathe, to be afterwards described. Attached to this extremity, likewise, is a cylinder of leather enclosed in a circular box, to render the cannula watertight. 2dly, Of a steel cannula, longer than the silver one, made to fit and work on the inside of it, having at its lower end three elastic branches which curve inwards, are rounded at their extremities, are intended to seize the stone, and are so contrived as, when drawn within the outer cannula, to pack closely together and form a smooth rounded end, well calculated to glide

along the urethra, and enter the bladder. The upper extremity of this cannula is numbered, or graduated, to enable the operator to ascertain the degree of expansion of the *litholabe* or claw, and is connected by a screw, to a rim or circular box filled with leather, somewhat similar to the one on the silver cannula, and intended for the same purpose—to prevent the escape of fluid during the operation. Sometimes *four* pincers, or claws, are used instead of three; and in certain cases two only are employed. But Civiale has found *three* the most convenient, in the generality of cases. 3dly, Of the *lithotriteur*, or perforator,— which is a steel rod six inches longer than the litholabe, having upon one extremity a crown with a number of cutting edges, or teeth, calculated to pulverize, or grind the stone or reduce it to fragments, and upon the other a graduated scale intended to denote the size of the stone within the grasp of the claw. This extremity is rounded, and for half an inch beyond the scale is slightly serrated, or ragged, in order that it may be securely held in the jaws of a grooved pulley designed to communicate to the lithotriteur a rotary motion, when passed through the cannula of the litholabe. 4thly, Of a brass frame, or lathe, somewhat similar to that used by watchmakers, the curved extremity of which has a square cavity, with lateral grooves on its interior, intended to receive the corresponding oblong shoulder of the silver cannula and to be secured in it by a screw; while the other extremity, or straight square shank of the lathe, is designed as a bar upon which a popet head slides backwards and forwards. Parallel with the bar, and fixed upon the superior extremity of the popet head, is a cylindrical brass tube, which encloses a spiral spring connected with a steel pivot, the cuplike extremity of which receives the rounded end of the *lithotriteur*, and by the operation of the spring keeps its dentated crown in perpetual contact with the stone. The lathe, during the operation, is held by the hands of an assistant. 5thly, A steel drill bow, about twenty-five inches long, jointed in the centre, firm but elastic, and well designed to play upon the pulley connected with the lithotriteur, may be said to complete the apparatus. Three, or four, sets of the external cannula, and litholabe, of different sizes, and a proportionate number of the lithotriteur, (ten or fifteen,) should accompany each case of instruments.

The patient having been sounded, the presence of a stone

detected, the state of the health inquired into, the condition of the bladder, the size, consistence and situation, as far as practicable, of the stone ascertained, and lithotrity determined upon, the first step is to enlarge the urethra, *gradually*, by the introduction of bougies, sounds, or catheters, commencing with small instruments, successively increasing their size, and suffering each to remain in the urethra ten or fifteen minutes at a time. This practice having been pursued for eight or ten days, the urethra, besides being dilated, becomes accustomed to instruments, and its natural sensibility thereby diminished. Some operators, however, and among them Leroy and Bancal, deem the preparatory treatment unnecessary; but by Civiale it is considered, generally, indispensable.

Immediately before commencing the operation, the bladder is explored by the sound, a second time, and the stone being felt, and appearing not too large to be embraced by the litholabe, the patient is laid on a bed and his hips elevated by bolsters, in order to make the stone gravitate towards the fundus of the bladder. A common catheter is then carried into the bladder, and the pipe of a syringe being adapted to its extremity, projecting from the urethra, tepid water, or strained barley-water, is injected until the patient complains of a disposition to urinate. The catheter is then withdrawn and the lithontripteur, (with the branches of the litholabe retracted within the cannula, and all other parts of the instrument accurately adjusted,) well greased, is introduced into the urethra by the right hand—while the penis is depressed by the left, parallel with the thighs, which are slightly flexed. The instrument passes readily until it arrives at the bulb of the urethra; it then meets with resistance, which is only to be overcome by depressing the external portion of the lithontripteur, and elevating its point, which starts forward, glides along the membranous portion of the urethra and prostate, and enters the bladder. The stone is then searched for, and, in general, may be felt distinctly. When found, and its exact position determined, the blades of the litholabe are expanded by pushing downwards the rim attached to its upper extremity, taking especial care to keep one blade directed upwards towards the linea alba, and parallel with the graduated scale, which should always be uppermost, and correspond with the screw on the silver or external cannula, while

the other blades lie along each side of the bladder, and in this
position can hardly fail to enclose the stone. By attention to
this rule, which is extremely important, it is impossible for one
of the branches to fall vertically upon the stone, and the sur-
geon, instead of enclosing it by chance or accident, seizes it to
a certainty, by drawing the litholabe upwards with the right
hand, while the left is employed in pushing down the external
cannula. To secure the stone firmly in the grasp of the claw,
the screw, which traverses the rim of the external cannula,
should be turned, and the two tubes rendered immoveable or
prevented from sliding upon each other. The next step is to
attach the frame or lathe to the lithontripteur, or adjust the
upper extremity of the perforator to the steel pivot projecting
by the spiral spring of the popet head, to apply the catgut to the
pulley and rotate it by very slow and gentle movements. If
the stone is found not to change its position by the action of
the perforator upon it, and the patient does not complain of the
motion of the bow, the rapidity of the drilling may be increased
and continued until the stone is perforated. When soft this is
soon accomplished, but when hard requires some time, and is
attended with a good deal of fatigue to the operator. In general,
it is best not to attempt too much at the first operation. Having,
therefore, succeeded in boring the stone at a single spot, the next
step is to remove it from the claw of the instrument. This
is done by expanding the blades, pushing out the stone by the
perforator, then closing them and removing the instrument from
the bladder. In doing this, however, great care must be taken
that no fragments are interposed between the blades and drill,
as often happens, but may be discovered by the difficulty of
withdrawing the instrument. A few turns of the crown of the
perforator, in such a case, will be sufficient to pulverize and
remove them. After the operation the patient should take a
warm bath, keep quiet for some hours, and attend to his diet.
The urine first discharged is generally found slightly tinged with
blood, and along with it pass off more or less sand and frag-
ments of the stone. In three or four days the patient is ready,
in most cases, for a second operation.

In the details just given, I have followed closely the directions
of Civiale, and have reason to believe, that, if pursued with
minute attention to all the points enumerated, that much less

difficulty will be experienced by operators in this country, who may now resort to the operation, than has been the case hitherto ; for I am persuaded that most of the mishaps recorded in former editions of this work, are imputable to want of attention to certain indispensable practical manipulations, the neglect of which must still eventuate in inevitable failure. But to guard, as much as possible, against ill consequences, I shall endeavour still further to inculcate such precepts, from the best authorities, as will be likely to prevent error, and facilitate the efforts of those who may feel disposed to engage in this branch of surgery, and may not have access to those European productions which have issued, latterly, in such numbers from the press.

Notwithstanding the facility with which, in many cases, the stone is seized immediately upon expanding the branches of the litholabe in the bladder, yet it sometimes happens, that it pertinaciously eludes their grasp. This is owing, generally, to the stone resting near the neck of the bladder, so that it comes in contact with the smallest diameter of the branches—that which is next to the extremity of the cannula. This will be understood, easily, when it is recollected that the branches, when opened into the bladder, represent a triangular pyramid, the base of which presents to the sacrum, and the apex to the neck of the bladder. The course to pursue, under such circumstances, is either to withdraw the instrument and raise still higher the hips of the patient, in order to roll the stone towards the fundus of the bladder, or else to draw the instrument with its blades expanded towards the penis, which must have the effect of gaining room by expanding the neck of the bladder, —naturally elastic, and susceptible of dilatation,—and of bringing the claws at the point of their greatest divergence, over the sides of the stone. Still further to facilitate its enclosure, it may be necessary to raise the handle of the instrument, by which the two *lateral* blades must depress the prostate and embrace the sides of the stone, while the *vertical* blade descends and rests upon its summit. Having in this way succeeded in seizing the stone, the handle of the instrument should be depressed, by which manœuvre the stone will be suspended, as it were, in the centre of the bladder, and being sustained in that position while the

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drilling is going on, there will be no pressure or irritation on the walls of the bladder.

If the stone, as often happens, should be too large to be embraced by the litholabe, this may be easily known by its retiring from the instrument when its claws are expanded to the utmost, and may be proved by examination of the graduated scale. In such a case the lithontripteur is removed, and another of larger dimensions substituted. When the stone does not exceed in bulk a hen's egg, it may be destroyed by the operation of lithotrity, but if larger, the surgeon will act wisely in not attempting the operation.

The most delicate and difficult part, perhaps, of the operation of lithotrity is the *turning* of the stone, in order to perforate it in different directions ; for after the first operation, and in all subsequent ones, this will become an important indication. The assistance of the *lithotriteur*, upon such occasions, is of the utmost importance. By moving this in different directions, sometimes pushing it forward, sometimes rotating it, and making it bear lightly upon the stone, the latter can be made to shift its position while still in the relaxed embrace of the claw, and as soon as the operator finds that the crown of the lithotriteur bears upon a surface not previously bored, the stone may be again seized and the drilling renewed. Having, in this way, perforated the calculus in numerous directions, it becomes so hollowed out, and weakened, that it may often be crushed by the pressure of the claw. Soft and friable stones, indeed, as Civiale and others have proved, may be destroyed, sometimes, by the litholabe alone, and without the aid of the perforator.

Before attempting lithotrity, it is of the utmost consequence to measure, *exactly*, by means of a catheter,—having on its side a graduated scale—the exact length of the urethra, which varies, as is well known, in different subjects.. As soon as the urine begins to flow, the measurement may be taken. Knowledge thus obtained, will prevent the operator from attempting to open the blades of the litholabe whilst in the *urethra*, from which very serious mischief has ensued in several instances.

Although the necessity of *injecting* the bladder, upon all

occasions, whether for the purpose of exploring its contents,—
which is sometimes done with the blades open as well as shut,—
or for seizing the stone, has been mentioned already, as essen-
tial, yet it may be well to state, in this place, that without such
preliminary measures, success can hardly be calculated upon.
No difference of opinion exists among lithotritists upon this point,
and, perhaps, it may be owing to attention in this respect, that
Civiale has never, as he declared some years ago, injured the
sides of the bladder, although he had, at the time the declaration
was made, introduced the lithontripteur upwards of five hundred
times. Should the fluid then escape, upon any occasion, previous
to operation, there can be no safety unless the bladder is again
filled before the introduction of the instruments.

As regards the number of applications of the lithontripteur,
that may be required before the cure is completed, it may be
remarked, that this will depend upon the size and texture of
the stone, upon the state of the patient's health, upon the condi-
tion of the bladder, and a variety of other circumstances. In
general, when the stone is soft and small, from one to three
operations will be required, and a greater number when it is
large and hard. In getting away the fragments, little difficulty
is now experienced. They usually pass off along with the
urine, from day to day, or are brought away by injections, or
by the repeated introduction of the litholabe, or by forceps with
two blades, and if too large to pass the urethra, may be easily
crushed. Instruments, indeed, have been invented by Jacobson,
Heurteloup, Weiss, and others for crushing stones, or for break-
ing them with a hammer, and have been found calculated, upon
certain occasions, to supersede the *lithontripteur*. One of this
description, admirably contrived for the purpose, either invented
or modified by Civiale, was lately sent to me, by that distin-
guished operator. An account of these instruments will be given
under the head of *Lithotripsy*.

Upon the whole, it may be stated that as *lithotrity* can never
entirely supersede *lithotomy*, though it will undoubtedly greatly
curtail it, the surgeon should strive to make himself so familiar
with both operations, and with calculous disorders, as to be able
to determine the kind of operation adapted to each particular
case, and prepared to perform either, as occasion may require.
Upon his *judgment* in this respect, I venture to predict, will his

success or failure in a great measure depend. Death has followed both operations, in numerous instances, although performed by Civiale himself, less frequently, however, since the various modifications of the instrument, and experience acquired in using them, than in the infancy of the art. Although Leroy, and some others, have performed lithotrity upon *children* of three and four years of age, and in a few cases, with success, as a general rule it should not be attempted on account of the sensibility of such subjects, and the difficulty of introducing instruments sufficiently large and strong to destroy the stone. In *women*, lithotrity is more difficult than might be imagined, owing to the very irritable condition in which the female bladder, when it contains a stone, is generally found, and to the difficulty of keeping it distended, during the operation, with fluids.

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On Lithotrity, consult de la Lithotritie ou Broiement de la Pierre dans la Vessie, par le Docteur Civiale, 8vo. Paris, 1826 ; Exposé des divers procédés, employés jusqu'a ce jour, pour guerir de la Pierre sans avoir recours a l'Operation de la taille, par J. Leroy, Paris, 1825, 8vo.; Lettres sur la Lithotritie, ou Broiement de la Pierre dans la Vessie, par le Docteur Civiale, Paris, 1827, 8vo.; Lettre sur la Lithotritie, &c., par le Docteur Civiale, Paris, 1828, 8vo.; Lettre sur la Lithotritie Urétrale suivée d'une revue générale, sur l'etat actuel de la methode Lithotritique, par le Docteur Civiale, 8vo. Paris, 1831 ; Lettres sur la Lithotritie ou l'Art de broyer la Pierre, par le Docteur Civiale, 8vo. Paris, 1833 ; Manuel Pratique de la Lithotritie, par A. P. Bancal, Paris, 1829, 8vo.; Description of the new Process of Perforating and Discharging the Stone in the Bladder, &c., by James Atkinson, Esq., 8vo. London, 1831 ; Lithotrity and Lithotomy compared, being an Analytical Examination of the present Method of Treating Stone in the Bladder, &c., by Thomas King, M. D., London, 1832, 8vo.; Principles of Lithotrity, or a Treatise on the Art of Extracting the Stone without Incision, by Baron Heurteloup, 8vo. London, 1831 ; Case of Lithotrity successfully performed by L. Deypere, in New York Med. Journal for Nov. 1830 ; A. G. Smith on Lithotrity, in North Amer. Med. and Surg. Journal, vol. xii. p. 256. This gentleman now resides in New York, but was instrumental, whilst living in the West, of introducing lithotrity into that region, by performing several successful operations.

SECTION IX.

LITHOTRIPSY.

Iт is now generally admitted that the operation of *lithotrity*, in the hands of prudent and experienced surgeons, possesses decided advantages in *certain cases* over that of lithotomy. But it is also admitted that, to perform lithotrity with any prospect of success, requires great dexterity, extraordinary caution, gentleness, perfect familiarity with the use and knowledge of the mechanism of the instruments; and, above all, *instruments* so well constructed and tempered—so diversified in shape, size, number, and adapted to so many different purposes—as to place the operation within the reach of a very limited number of surgeons, however competent in other parts of their profession to excel and even distinguish themselves. Perhaps it will not appear strange then, when asserted, that no man, now in existence, can be called a *perfect lithotritist*, except Civiale, who, as conceded by all that have witnessed his exploits, is as dexterous and successful with his *litholabe* and other forms of apparatus *peculiar* to himself, as can be imagined. From all this, it may be reasonably inferred, that the cause of failure in so many instances, amongst European and American surgeons, is mainly owing to intrinsic difficulties in the operation itself, to want of experience, to deficiency in mechanical ingenuity and tact, to want of proper instruments and skill in manœuvring them, as well as the idea so prevalent from the very moment of the discovery of *lithotrity* down to the present time, among physicians and others little accustomed to operations of any description, " that *lithotrity* is very easy and simple, and may be performed successfully by those who would not dare to venture on *lithotomy*."

Fortunately, in this state of things, an important discovery has

Fig. 2. The termination of the same instrument, the beaks separated.
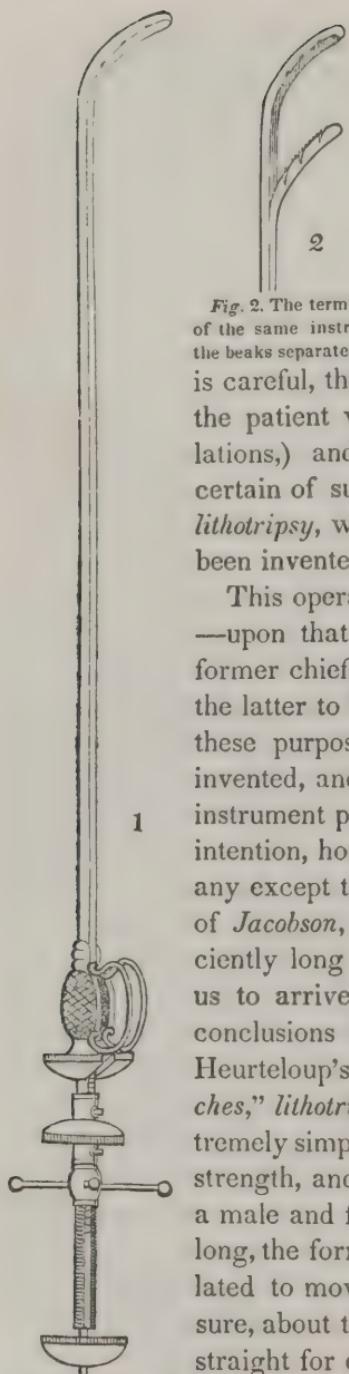
Fig. 1. Heurteloup's percuteur.

been made within the last few years, that there is no longer absolute necessity for resorting to *lithotrity*, but that the same end may be accomplished by other means, not less efficient, within the reach of a greater number of surgeons, less painful to the patient, attended with little or no risk, (if the surgeon is careful, the case adapted to the operation, and the patient willing to conform to certain regulations,) and, under favourable circumstances, certain of success. I allude to the operation of *lithotripsy*, which may be said, perhaps, to have been invented by Baron Heurteloup.

This operation is founded upon two principles —upon that of *crushing* and of *percussion*—the former chiefly adapted to soft and friable stones, the latter to hard and compact. To accomplish these purposes, several instruments have been invented, and various modifications of the same instrument proposed and executed. It is not my intention, however, to describe or comment upon any except the instrument of *Heurteloup* and that of *Jacobson*, both of which have been used sufficiently long in Europe and America, to enable us to arrive, with some degree of certainty, at conclusions respecting their merits and defects. Heurteloup's " *percuteur*," " *pince à deux branches*," *lithotripteur*, as it should be called, is extremely simple in its construction, remarkable for strength, and consists chiefly of two portions— a male and female steel rod, about twelve inches long, the former enclosed in the latter, and calculated to move backwards and forwards at pleasure, about the size of an ordinary adult catheter, straight for eleven inches of its length, and at its lower extremity, turned up and gently rounded in form of a beak, at an angle of about 55 degrees. Near the upper extremity of the male rod, there is a graduated
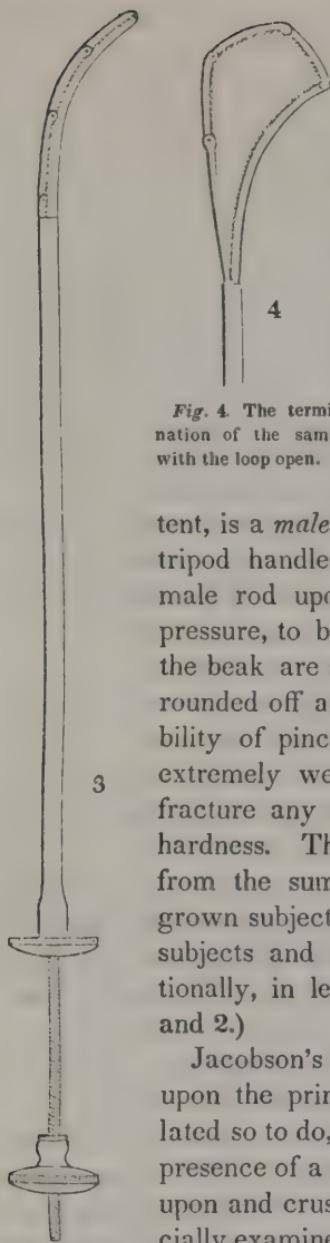
Fig. 4. The termination of the same with the loop open.

Fig. 3. Jacobson's instrument.

scale, intended to indicate the size of the stone, and the summit of the rod is terminated by a steel bowl, designed to receive pressure of the hand in crushing the calculus, or the blow of a hammer. In the latter case, the instrument is held within the grasp of a *vice*, which is applied to a square shoulder on the female rod, corresponding in situation with the graduated scale on the male rod. Above this shoulder, for two inches and a half in extent, is a *male* screw, upon which works a small tripod handle, calculated to drive forward the male rod upon the female, and, by *graduated* pressure, to break the stone. The extremities of the beak are serrated, (but, at the same time, so rounded off and guarded as to prevent the possibility of pinching the bladder or urethra) and extremely well calculated to seize, retain, and fracture any stone of ordinary dimensions and hardness. The entire length of the instrument, from the summit head to the beak, for a full grown subject, is about 18 inches. For younger subjects and for children, it will vary proportionally, in length and diameter. (See *Figs.* 1 and 2.)

Jacobson's instrument is not designed to act upon the principle of *percussion*, nor is it calculated so to do, but is used, when shut, to detect the presence of a stone, and, when expanded, to close upon and crush it, and would seem, when superficially examined, admirably calculated for the purpose. It consists of a silver cannula, eight or nine inches long, a quarter of an inch in diameter, attached to the superior extremity of which is a circular steel plate or rim, an inch wide. Through the cannula passes a steel rod, which projects beyond its lower extremity, two or

three inches, in form of an ordinary sound, flattened and serrated on its concave surface, and smooth and half round on its convex. Connected with this extremity by a hinge, resembling it in form and size, but only an inch in length, is a piece of *chain*, which, in like manner, is attached to a second and a third portion, the last of which is riveted to a straight rod, which, like the former, passes through the cannula, for the length of twelve inches, and is intended to retract or expand the *links*, so as to produce, at will, the form af a common curved catheter or that of a loop. The superior extremity of the straight rod, last mentioned, for three inches in extent, is a male screw, corresponding with a female one, which passes through the centre of a double convex rim, intended to work the chain backwards or forwards, as may be required. (See Figs. 3 and 4.)

With either of the instruments above described and figured, the operation of *lithotripsy* may be conveniently and successfully performed. In describing the mode of operating, however, I shall confine myself almost exclusively to the lithontripteur of *Heurteloup*, because I have been more accustomed to the use of it in practice, and because I think it possesses advantages over that of *Jacobson*, which I shall endeavour, afterwards, to point out, and which I think will be appreciated by all who are disposed to give trial to each, and are so situated as to be competent to decide between them.

It is a matter of no little consequence, before undertaking *lithotripsy*, to determine upon the cases best adapted to it. To want of care in this respect, and perhaps to want of judgment in some cases, I may add, may be attributed, there is reason to believe, the mishaps which have occurred in so many instances, and which have been so sedulously concealed from the public eye, in Europe especially, while the successful cases have been as carefully blazoned forth. I shall not be accused, I trust, of making such remarks invidiously, when I assert that the reference is not to individual cases, or to *lithotripsy* alone, but will apply particularly to *lithotrity*. At all events, I shall set the example, if not already done by others, of stating the successful as well as unsuccessful cases, the only mode by which the profession will be able to form a correct judgment with respect to an operation still in its infancy, and, in many points of view, so interesting to science and humanity.

When applied to by a patient, supposed from the *symptoms* to have stone in the bladder, I would advise rest and quiet for three or four days,—especially if just from a journey,—the free use of diluents, and a gentle purgative. After this, and at a moment when the patient has less than his accustomed irritation about the region of the bladder and urethra, a simple steel sound, or a silver, or gum elastic catheter may be introduced very cautiously and deliberately, and moved in various directions—for the purpose of detecting the stone, and judging in a measure of its size, situation, texture, shape, and for ascertaining whether it be rough or smooth, whether more than one, &c.

It often happens that the sound is introduced with the utmost facility, and without much inconvenience to the patient, the bladder carefully explored, and no stone felt. In such cases, the surgeon should not rest satisfied, but, discontinuing his examination after a few seconds, should renew it again in a day or two, and sound at one time when the bladder is full, at another when empty, and endeavour to make his instrument, though in the most cautious and careful way, enter into every nook and corner of the bladder, where it would be possible for the stone to lurk.

He should also place his patient, while sounding, in a variety of positions—sometimes on his side, sometimes on his knees, and, upon other occasions, nearly on his head—never failing, in difficult or obscure cases, to introduce a finger into the rectum, for the purpose of elevating the stone, or of removing it from some cyst or hiding-place, and of bringing it in contact with the sound. Very small stones, or fragments, may be touched repeatedly by a person unaccustomed to sounding, without his being sensible that there is a particle of foreign body in the bladder; and even an experienced surgeon will frequently find himself at fault in this respect. From having experienced more or less difficulty in detecting a stone, occasionally, I have, latterly, employed an instrument of peculiar construction for sounding, which I shall notice hereafter.

If the stone is distinctly felt, is of small size, and has not existed very long; if the patient is an adult, middle-aged, or even advanced in years, has, in other respects, a sound constitution, and the bladder and urethra are not remarkably irritable, *lithotripsy* may always be resorted to, and with every prospect of success.

But, on the contrary, if the stone is large, hard and rough, has existed for many years, the bladder extremely irritable, contracted, its walls thickened, the kidneys and ureters diseased, the prostate gland enlarged, the .stone imbedded in a cyst, or fastened upon a fungus; if there has been for months or years a discharge of purulent matter, or of large quantities of slime from the bladder, and the patient is advanced in years or enfeebled in constitution, there will be great risk in attempting *lithotripsy;* and the chance of recovery will be greater, perhaps, from *lithotomy,*—though from the latter operation, also, patients thus situated, will be extremely apt to die. Both of these are, of course, extreme cases ; and between the favourable and unfavourable, there are many intermediate grades, where success must depend, in a great measure, upon the judgment and experience of the surgeon in the treatment of calculous complaints, whether by lithotomy or otherwise. Again, there are cases, as in children, or very young boys, where, from the very small size of the urethra, or the unmanageable dispositions of the patients, very little can be expected from *lithotripsy*, or any other operation than lithotomy, which last, in such subjects, fortunately, is almost invariably successful. Upon the whole, it may be stated, that there are many cases, particularly in middle-aged and old people, which may admit of a cure by *lithotripsy*, if performed before the stone becomes large and the bladder diseased ; and, in this point of view, the operation holds out many advantages ; for there are hundreds of patients, who, if they could be persuaded that their complaint, in its incipiency, admitted of relief by a process comparatively easy and free from danger, would willingly submit to it ; but who would shrink from *lithotomy* until compelled by years of suffering to undergo it, and then, unfortunately, with little chance of success.

Having ascertained the existence of stone in the bladder by accurate sounding, and determined to submit the patient to *lithotripsy*, the next proceeding, on the part of the surgeon, is to prepare him for the operation, by a regular system of diet, by depletion, if necessary,—and there is nothing in the case to contraindicate the measure,—and by the careful introduction of sounds, catheters, occasionally, in order to accustom the urethra and bladder to the use of instruments, to ascertain the exact position

of the stone, its usual location, &c. In using such instruments, however, great care must be taken not to irritate the bladder, and to discontinue them the moment the patient complains; and, upon no occasion to *rake* the bladder, which cannot be done, even in the most insensible patient, without great risk of inflammation of that viscus, and even death. *Diet*, too, is of so much importance, previous to attempting the operation, as to be, in my estimation, almost a *sine qua non*, and ought to be strictly enjoined, in some cases, for weeks together, previous to any attempt to seize or break the stone. With most patients, I find a dish of black tea and a bit of dry bread for breakfast, and the same for tea, with boiled rice for dinner, together with a quart of barleywater, (to which may be added, if required, a small quantity of cream of tartar to keep the bowels soluble,) in twenty-four hours, amply sufficient to support any ordinary adult, and admirably adapted to lessen irritability, keep down inflammation and soothe the urinary passages. By steady perseverance in these measures, almost every patient can be brought into a proper state to undergo the operation with fair prospect of success; but extraordinary vigilance is sometimes necessary to guard against irregularities and deviations, and to prevent a patient from deceiving himself as well as the surgeon. In this country, above all others, where food is so abundant that even beggars live luxuriously, and where the idea is so prevalent, among all classes, that strength is necessarily associated with plentiful supplies to the stomach, it is extremely difficult to persuade patients that they can go wrong in gormandizing. Unfortunately, in too many instances, they find out their mistake too late, and the surgeon discovers, to his great mortification, that he has been deceived and trifled with.*

As an important preliminary to the operation, a firm, thick

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* There is no establishment so much wanted in this and other large cities as a " *maison de santé*," where patients, especially those from a distance, could be subjected to a regular system of dietetic discipline. The boarding-houses, even the best of them, are unfit for invalids, and the respectable ladies who often keep them too poor and too badly compensated to give the necessary attention to the sick. And as to *nurses*, they are often worse than useless, or only prove beneficial by consuming the delicacies, tid-bits, and potations intended by officious and foolish friends for their sick brethren. When will boarding-house ladies, moreover, divest themselves of the silly and pernicious idea, that by restricting the diet of invalids they will incur the reproach of starving them for mercenary purposes, and thereby hurt the credit of their establishments?

mattress and several substantial pillows will be required, the
former for preserving the patient in the most easy and com-
fortable posture, and to prevent him from being overheated, which
is so apt to be the case when smothered in feathers, the latter for
elevating the pelvis to the requisite altitude, by which movement
the stone will have a natural tendency to subside towards the
fundus of the bladder, the only position in which it can be seized
conveniently. Some surgeons, *Heurteloup*, in particular, recom-
mend an arm-chair or kind of sofa, for the patient to lie upon
during the operation; but, independently of the trouble of car-
rying such a machine from house to house, more or less alarm
is always created in the mind of the patient by such a formi-
dable array in the shape of an apparatus, and as, in reality, there
is no necessity for any but the most simple means, such as are
within the reach of the surgeon in most families, he should avail
himself of them with as little parade as possible. A time having
been appointed for the operation, the patient should be enjoined
to suffer the urine to collect in his bladder from two to four
hours previously, and, upon no account, to permit any of it to
escape. But some patients cannot retain their urine beyond an
hour, or even so long a time. In that case, a gum elastic or
silver catheter may be introduced, and the bladder injected
with tepid water, by means of a syringe or gum elastic bag—
taking especial care not to employ force or to distend the viscus
too suddenly, or to throw in so large a quantity as to give the
patient pain, otherwise spasm of the bladder may follow, and a
train of other alarming symptoms. If possible, it is best to
dispense with the injection, inasmuch as the introduction of the
catheter always renders it more difficult to pass any other in-
strument immediately afterwards. As a general rule, too, I
would remark that the best period for the operation is in the
morning, before the patient quits his bed; for I have almost in-
variably observed, particularly in winter, the moment the patient
rises and walks about his room, that there is tendency to spasm
about the neck of the bladder, and that an instrument cannot
then be so readily introduced as it might have been a few
moments before.

These preliminaries having been settled, an assistant places
one or more pillows beneath the patient's pelvis, another under
his head and shoulders, and while the thighs are relaxed and

brought nearly together, the body lying parallel with the bed
and along its edge, the surgeon standing on either side or in
front, having well oiled the lithotripteur, introduces the beak of
it (the blades closely approximated) into the urethra, and by
slow but decided movement causes the instrument to glide along
the passage, to which its own weight partly contributes, as far
as the triangular ligament, which it is known to have reached
by the slight resistance met with, and then by depressing the
handle gently between the thighs, the point starts suddenly for-
wards through the prostate gland and enters the bladder.   In
general, the introduction is effected immediately, but in some
cases difficulties are experienced, arising, there is reason to be-
lieve, from the difference in the conformation of different patients,
from some being more irritable than others, so that spasms
are induced, or from rudeness or violence on the part of the
operator, or from his being too sudden and rapid in his move-
ments, from an over anxious desire of aiming at feats of dex-
terity.   If any such difficulties should arise, it is better not to
persevere by forcible endeavours to overcome them, but to post-
pone the operation to a future period. Should a stricture, either
spasmodic or permanent, exist in the urethra, the surgeon must
previously get rid of that before he ventures upon *lithotripsy*.
The lithotripteur having been introduced, is not to be carried
about roughly from side to side, or fore and aft, for the pur-
pose of raking after and suddenly hunting up the stone, but
should be carried very slowly and gently towards the fundus or
most dependent part of the bladder, and by the slightest touches
with the heel of the instrument, an attempt made in various
situations, from right to left, or *vice versa*, to detect the foreign
body. During these manœuvres, there should not be the slightest
whisper in the room, or complaint, if possible to avoid it, on
the part of the patient.   An experienced hand and an accurate
ear will soon detect the stone, and be able to say by the peculiar
sensation communicated through the vibrations of the instrument,
whether the stone be rough or smooth, large or small, hard or
soft, whether there be more than one stone, &c.

However cases now and then present themselves in which it
is not so easy to feel the stone at once, and determine its cha-
racter and position.   This may be owing to a variety of cir-
cumstances.   The patient may be uncommonly irritable, spasm

of the bladder may be induced, by which the urine is forcibly driven from the bladder along the urethra and instrument, or there may be an hour-glass contraction of the bladder, the stone being in one part and the instrument in the other, or the stone may be encysted, or may lurk under the prostate, or there may be naturally uncommon width in the lateral diameter of the bladder, or the rectum may project on one or both sides of the bladder, compress it and destroy its shape, or hemorrhoids or hardened fæces produce a corresponding alteration in its figure. Under these and other trying circumstances, the surgeon should never forget that the longer he gropes about, and the more determined he is not to be foiled, the greater will be his chance of failure. "*Nullum numen abest si sit prudentia*," should be his motto, and the sooner he acts upon it, by withdrawing his instruments, the better.   But suppose, on the contrary, that none of these difficulties have been encountered; that the stone has been readily felt, without giving the patient much pain; that the instrument may be readily manœuvred in the bladder, then the next object in view will be to loosen the blades of the lithotripteur, by turning the tripod or handle of the vice, cautiously opening the claws by pushing back the male rod, and then endeavouring by short, sudden, but gentle lateral movements, with the heel of the instrument, on the floor of the bladder, to pass the gutter of the female rod beneath the stone, the situation of which, with respect to this part of the instrument, may be readily ascertained by depressing occasionally the male rod. It is astonishing with what facility, in some cases, the stone, by a slight lateral movement, may be shuffled into the jaws of the lithotripteur, so much so that the first attempt, sometimes, in the hands of a dexterous surgeon, will suffice for this part of the operation. Having secured the stone within the grasp of the forceps by quickly, but gently, pushing downwards the male rod, the surgeon next turns the tripod with one hand while he steadies the instrument with the other, and gradually strains upon the stone until he feels or hears it crack beneath the pressure of the serrated claws in which it is embraced. Soft and friable stones give way quickly under moderate pressure, and where no strain is perceived upon the tripod ; hard and flinty stones, on the contrary, crack with a sudden jar or snap, and splitting asunder quickly, make a report like the distant smack of a whip, while the tripod is suddenly loosened,

but generally resumes its hold upon the remaining portion of the calculus. There are some calculi, however, too hard, and solid to be thus broken by graduated pressure; and if the surgeon, not aware of this, and possessing but little mechanical tact or skill, should apply inordinate force to his screw, the beak of the male rod might be broken off, or so sprung as to prevent it from being disengaged readily from the stone. In such a case, then, instead of straining upon his instrument, in the vain hope of smashing the stone, the proper course to pursue is to loosen the tripod, and by gentle taps with a hammer upon the bowl on the summit of the male rod, to fracture the stone or quarry it. But let it not be supposed that such an exploit can be safely performed while the lithotripteur is merely held in the operator's hand. The percussion in that case, would necessarily extend to the walls of the bladder, and might be followed by disastrous effects. Fortunately, these are readily guarded against by a *vice* (lined with lead, adapted to the shoulder of the female rod, and held by the surgeon and assistants,) admirably calculated, in every respect, to fulfil the purpose for which it was designed. Having broken the stone, either by graduated pressure or by percussion, the surgeon next closes his instrument and opens it repeatedly, while, at the same time, he moves it quickly from side to side to crush and wash out any small fragments that may project from the edges of the groove, and might wound or lacerate the neck of the bladder and urethra in the act of withdrawing the instrument from that viscus. If he has reason to believe that, by these manœuvres, the fragments have not been gotten rid of, he may generally accomplish his purpose completely, by slight strokes of the hammer in the manner already directed. After this, the sooner the lithotripteur is removed from the bladder the better, and the shorter the time the surgeon has taken to perform the operation, the greater will be the chance of success. In general, by the time the operation is completed, there is an urgent desire, on the part of the patient, to let off his urine; but it seldom happens that large fragments come away in the first passage of the urine. In general, only a few small pieces are observed, together with a little sand, and now and then a few drops of blood, produced by the pressure of the shaft or fulcrum of the instrument on the neck of the bladder. It is not desirable, indeed, that the fragments should come away until the soreness

of the urethra has passed off, and, fortunately, most patients have the facility of retaining them by lying on their side, and not emptying the bladder completely at each time of evacuating, but always retaining a small portion of urine. In a day or two, however, they begin to present themselves at the neck of the bladder, where they remain a short time, exciting more or less unpleasant feeling, and are then suddenly carried forward and bolted out before the patient is aware of it. In this way, one after another, fragments may pass in rapid succession, and in a few hours amount to a large collection, the soreness gradually passes away, and after the lapse of five or six days, the patient is prepared to undergo another operation.

Such, however, is not the invariable result of an operation for lithotripsy, for although the surgeon may have been abundantly successful in breaking up the stone, and may have been extremely rapid and dexterous in his operation, and communicated as little irritation as possible, still the bladder is very prone to resent any offence, even the slightest, that may have been offered to it, and will vent its displeasure on the surrounding and even distant parts. Hence, a few hours after the operation, or, in some cases, in a day or two, a chill is induced, followed by fever, profuse perspiration, spasms of the bladder, &c., or these symptoms may have been brought about by the lodgement of a fragment in the urethra. The best course to be pursued, I think, in this state of things, is to bleed the patient as soon as the fever has come on, to administer an opiate injection occasionally, to restrict the diet within the closest bounds, and not to permit the patient to get out of bed—a rule, indeed, which the lithotriptist would do well to observe after each operation, whether any bad symptoms show themselves or not. If a fragment has lodged about the neck of the bladder, and seems disposed neither to retire nor advance, the best plan is to push it back into the bladder by a large catheter or sound; if it has advanced within a few inches or a short distance of the external orifice of the urethra, then it may be got away generally by a bent probe, by a pair of urethra forceps, or, still better, by the curette of Leroy,—a most ingenious little instrument, admirably adapted to this and many other purposes.*

* " Elle est formée d'une canule plate, à l'extrémité de laquelle est fixée par une charnière une petite plaque creusée comme un cure-oreille. Son articula-

When the irritation has entirely passed away, which generally happens in four or five days, or, at farthest, a week, the surgeon renews his attempts to seize and destroy the stone, in the manner already described ; but, as each operation generally becomes more difficult in proportion as the stone is diminished in size, owing to the greater difficulty of feeling a small foreign body than a large one, it will be proper to detail certain expedients which may be resorted to advantageously in most instances. The course to pursue, then, under such circumstances, is to introduce the lithotripteur, and having reached the fundus of the bladder, to retract the male rod for half an inch and upwards, and fish about from side to side, or in various directions, with the groove of the female rod, and, by so doing, the operator will be very likely to collect one or more fragments, the presence of which can be readily ascertained by closing occasionally the jaws of the instrument, crushing the fragments, and then again expanding and making further search, until all the pieces that happen to fall within the gutter of the lithotripteur are completely broken up or pulverized, and may afterwards be thrown off by the action of the bladder. It is a leading principle indeed, now, with all lithotriptists, to reduce the fragments by successive attempts, to the smallest compass, so as to facilitate their passing off quickly, and with the least possible risk of irritating, or tearing the urethra ; and fortunately the bladder, in most instances, seems to understand the surgeon's views, and is abundantly disposed to second them. But, in other cases, old and debilitated patients, especially, there is sometimes so little power in the bladder, that it does not contract sufficiently to expel the foreign bodies which may have been broken up into numerous pieces, and, by accumulating, may still keep up irritation, or in time, by the conglomeration and matting together of particles, lay the foundation of another stone. This was one of the strongest objections, some years since, both to lithotrity and lithotripsy, so much so, that it was customary at that period to recommend *lithotomy* in patients thus situated,

tion avec la canule a lieu de telle sorte que, dépassant un peu en arrière, elle forme un talon sur lequel est fixée une tige qui par court toute la longueur de la canule, et se termine par quelques pas de vis ; suivant que cette tige est poussée ou tirée, las curette se coude ou se redresse."—*De La Lithotripsie, par Leroy D'Etiolle, Paris,* 1836, p. 300.

rather than either of the other operations. By the ingenuity
of Heurteloup, however, this difficulty has been in a measure
obviated, by means of the "*evacuating sound*," an instrument
of peculiar construction, and exceedingly well calculated to
collect and bring away, without annoyance to the bladder and
urethra, fragments of considerable size, as well as the sand, or
debris which accumulates in such quantities in the hollows
and certain rendezvous met with in most bladders. But, for-
tunately, there is another circumstance, independently of the
advantage to be derived from the instrument referred to, which
may serve to console patients in whom the power of the blad-
der, to expel the urine with its accustomed force is diminished
or destroyed—that there is reason to believe, in certain cases,
that soft and friable stones are susceptible of *solution* in the urine,
and are removed in the shape of sand or mud, mixed with slime
and other matters. Heurteloup speaks of cases of the kind, and
one of this description, I am very sure, has occurred in my own
practice.

I do not pretend, in this communication, to give more than a
sketch or outline of *lithotripsy*, illustrated by a few cases; and if
what I have said shall answer the purpose of drawing the atten-
tion of the American surgeon to the operation, of clearing up
the doubts of some and confirming the sentiments of others, my
labour will not be in vain. It has been said, and is even now
often reiterated, that I have *decried* the operation. This is a
great mistake. I have never condemned *lithotripsy ;* but have
always doubted of the perfect success of "*lithotrity*," so far as
the great mass of operators is concerned. In this text-book,
years ago, and in lectures, I have spoken of the original idea of
destroying, by instruments, stone in the bladder, as a most
ingenious and beautiful one—have said that the time would
come, when such instruments would be so *modified* and *improved*,
as to deserve the highest commendation, and that the operation
would become an established one, though it would never super-
sede, in toto, *lithotomy*. Have not my predictions been verified?
Have not the most disastrous consequences followed *lithotrity*,
even in the hands of *Civiale himself*, the prince of lithotritists,
whose magic powers are still unequalled and can never be sur-
passed in his *particular line*, and in the management of *his own
tools?* Is not *lithotrity* now spoken of in Europe, constantly and

without reserve, as the " *old method*," the " *ancient operation ?*"
That more or less of the same difficulty, though never, I trust,
to the same extent, will attend *lithotripsy*, I have no doubt; that
patients will be subjected to the operation who are unfit for it;
that mistakes will be committed by the inexperienced and adven-
turous; that the most wary and prudent operators will be
baffled, and foiled, and deceived in their expectations, partly from
perverse and obstinate patients, partly from neglect of those
about them, and partly from the complicated nature of cases
which no human wisdom could foresee, I am prepared to believe
and admit.*   But " Quia non omnes convalescunt idcirco nulla
igitur est medicina," is a maxim of sound sense and truth,
which should never be lost sight of—which will apply, now and
then, to every operation in surgery, and to every medical case,
from the most complicated to the most simple.

Before proceeding to detail the cases of lithotripsy in which
I have been engaged, and from which most of the foregoing
remarks have been derived, I propose to make a few comments
upon the instrument of *Jacobson*, and to compare it with that of
Heurteloup ; in so doing, however, I beg leave to declare that
it is not my intention to unfurl the banner of opposition on
the one hand, or to be led captive on the other, but " to render
unto Cæsar the things which are Cæsar's."   One advantage,
at least, an American possesses over Europeans, amidst their
controversies concerning inventions, improvements, discoveries
—that he can be impartial.   Of Heurteloup, *personally*, I know
nothing; of Jacobson, nothing; of French and English litho-
triptists and anti-lithotriptists, their politics, parties and squabbles
and academical debates, with few exceptions, I know and care,
if possible, still less.   With their *instruments* I am well ac-
quainted, and equally well disposed to give them all the credit,
in my poor judgment, they deserve.

* In a letter lately received from my friend, John Green Crosse, Esq., a dis-
tinguished surgeon of Norwich, in England, it is remarked, " the use of litho-
tripsy, as a substitute for lithotomy, is rather fading here.   We hear less and less
of the practice; it is, however, a most valuable resource in certain cases, and in
dexterous hands; though by no means possessing the recommendations which
some have represented, of being suitable to *provincial* surgeons of small experience.
These can, I think, better lithotomize than lithotrize, and numerous fatal instances
from the latter method, under their hands, have come to my knowledge in this
district."

Jacobson's instrument is an ingenious and beautiful one ; extremely simple ; remarkably strong ; not too bulky ; of the best form, seemingly, for easy introduction ; readily withdrawn if any part of it should give way ; better adapted, as regards facility, than any other instrument to *catch* and *enclose* a small stone, and when seized, of great power to break it ; and, upon the whole, well calculated, *apparently*, for success. But withal, it is a dangerous weapon ; for the natural tendency of the closing of the loop, or zigzag chain, which binds upon the stone, in the act of demolishing it, is to drag the folds about the neck of the bladder and prostate into the embrace of the steel rods, where they emerge from the mouth of the cannula, and to pinch them to excess. Nor is this all—the irregular loop, full of small angularities ; the numerous joints, and rivets, and dovetails ; the prominent knots, and depressions, about each hinge ; the inaccuracy and uncertainty, and lateral irregularity of the closing of the different joints ; the long line of loop, running from stem to stern along the perpendicular edges which frown from the serrated flat lining the interior of the chain ; so well calculated to rake and harrow the plain surface of the bladder ; so unadapted to descend into the nooks and hollows ; to pass beneath the overhanging bank of the prostate ; to enter into a cyst, or between the folds of a contracted bladder— together with the impossibility of enclosing a *large* stone ; of the difficulty of picking up very small fragments after the stone has been quarried, and of applying the *principle of percussion* to the instrument, and thereby its inaptitude to *very hard stones ;* of the certainty of numerous small fragments being drawn into the cannula between it and the chain, so as to render the removal of the instrument from the bladder difficult and painful; to say nothing of the difficulty of fixing the stone securely, and of preventing it from shifting from side to side of the instrument, in the act of closing the chain ; which want of steadiness, in part, arises from the great length of the chain, which gives it a serpentine motion when dragged upon, and, in part, from the chain not *hugging* the stone *closely* over its entire surface, but standing off,—particularly if the stone is flat, as most stones are,—at every part of the loop corresponding to a joint in the chain ; and, lastly, the complaint of most patients when the loop is expanded in the bladder, and an

attempt made to scoop the stone within the bow of the instru-
ment—a complaint so characteristic, that when I passed it
upon one occasion, the patient cried out, without knowing the
conformation of the instrument, that " I had put a basket into
his bladder."

These objections are the result of my own observation; I have
not hunted up European publications to cull them from; I have
seen, indeed, but one publication on this particular subject, and
from that I will venture to make an extract, as it seems to confirm
the view I have taken:—" La découverte de cette instrument, était
precieuse lorsque celui de M. Heurteloup n'existait pas, car on
pouvait commencer avec l'instrument à trois branches et con-
tinuer avec le brise pierre de M. Jacobson : mais a présent il est
devenu absolument inutile : l'instrument de M. Heurteloup le
remplace toujours : et j'ai prouve, dans le chapitre précedént,
que le perceuteur peut s'appliquer, avec le moins de dangers, et
le plus de facilité possible, dans tous le cas où la lithotritie est
practicable ; c'est pourquoi il est evident que l'instrument de M.
Heurteloup est preferable à tous les autres, et que M. Velpeau
a eu tort de choisir l'instrument de Jacobson comme le meilleur.
La preuve la plus manifeste de la verité de mes paroles est que
cet instrument n'est employe par aucun lithotriptiste connu."*
Not to be unjust, however, to Jacobson's instrument, (whatever
my own impressions of it, or those of others, may be) it is but
fair to state, that it has been employed successfully in this
country, in several cases, by Dr. Jacob Randolph, of this city,
and Dr. Nathan Smith, of Baltimore;† and the inference, there-
fore, is plain that it must be an instrument of some merit,—and
this I am not disposed to deny, whilst, at the same time, I am
inclined strenuously to contend that the *lithotripteur* of Heurte-
loup is a better one—and for the following reasons: 1st. That
in addition to its working upon the principle of *gradual pressure*,
it combines the important power of *concussion ;* 2d. That it does
not give the patient so much pain, either during the introduction
or whilst manœuvred in the bladder ; 3d. That it can grasp a
larger stone ; 4th. That its beak can descend behind the pros-
tate and enter every corner or pocket of the bladder ; 5th. That

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* Sur La Lithotripsie et la Taille, par M. P. Doubovitzki, Paris, 1835.

† Both these gentlemen, as I learn, now employ Heurteloup's instrument in
preference to that of Jacobson.

it is extremely well adapted to seek out and pick up fragments ;
6th. That it is so constructed as to render it almost impossible
to *pinch* the bladder, were the surgeon even disposed so to do ;
7th. That although not so strong, *perhaps*, as Jacobson's chain,
that it would be next to impossible, when well tempered, to
break it ; 8th. That the only inconvenience I have ever expe-
rienced from it, is the liability of the groove, in the female rod,
to become clogged with sand and small fragments, so as to give
the patient pain in withdrawing the instrument—that this, how-
ever, is easily obviated, after a little practice, by opening the
forceps, and by slight lateral movements, washing out the frag-
ments, and afterwards crushing the remainder by a few taps of
the hammer.*   One remark, however, may be made in conclu-
sion, and should not be lost sight of, as regards the employment
of instruments in general—that almost every surgeon, when once
accustomed to a particular instrument, even although that instru-
ment may be an awkward and ungainly one, will perform better
with it than another surgeon equally skilled but unaccustomed
to it.   The modifications of Heurteloup's and other instruments,
indeed, are almost endless, and there is scarcely a lithotritist but
has some instrument peculiar to himself.   Hence, probably, the
great variety of opinions on the subject, and the endless and
bitter controversies which have been for some time past, and still
are, waging among them.   *Time*, the great instructor in all
things, will be able " tantas componere lites."   Many of the
foregoing remarks will be illustrated by the following cases.

CASE I.

Dr. F.———, of North Carolina, consulted me on his case in
June, 1835, which, in several respects, was a distressing one. He
had submitted to lithotomy some months before I saw him ; the
wound, however, never healed, but remained fistulous, and in a
little time the stone made its appearance again, and seemed to be
enlarging with rapidity.   He had been making attempts, I found,
to crush it, by means of Jacobson's instrument, but had never suc-
ceeded—owing to the severe pains and spasms which followed

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* This difficulty has latterly been overcome by the large window at the extre-
mity of the instrument.

each trial—in seizing it, or in detaching fragments. I proposed the employment of *Heurteloup's lithotripteur*, and explained to him its mechanism, with which he was so much pleased as to consent to its introduction a day or two after. So extremely sensitive, however, was the bladder, and so great his apprehension, that he would not suffer the instrument to be introduced except in the slowest and most deliberate manner, consuming five or six minutes, frequently stopping its progress with his own hands, and, in fact, almost performing the operation himself. Having at last reached the bladder and felt the stone, I expanded the forceps to an inch and upwards in width, seized the stone and broke off a large piece of it. All this was effected so quickly, according to his ideas of time, as greatly to delight him, and determined him to submit to further efforts to obtain relief. Accordingly, a few days afterwards, another trial took place; and although the operation was performed partly by me and partly by himself, it proved equally successful as the first attempt, and encouraged him to proceed with other trials, at one of which Dr. Hays and other gentlemen were present. After each operation, however, there was always more or less chill and fever; and as the patient's constitution had been greatly impaired by long suffering previous to my having seen him, I was almost afraid, after each trial, to touch him again. In proportion, however, as the fragments were gotten away, (though sometimes by sticking in the urethra they gave him great uneasiness,) his constitution improved so rapidly as to enable us to renew attempts with greater frequency, but always with more or less success. Towards the end of July, however, I was obliged to leave town, and to take my instruments with me, which put a stop to further proceedings for several weeks. During my absence, the patient had procured an imitation of Heurteloup's lithotripteur, and assisted by some of his friends, particularly by Dr. Rose, had succeeded in removing other fragments. From that period, during the whole of the last winter, he was engaged in operating on himself, with occasional assistance from myself and Dr. Rose, and was enabled, by great industry and perseverance, to make in the spring a collection of fragments and sand amounting to 3 ʒ 12 grs. in weight. By this time his health was so much improved as to enable him to return to Carolina. Such is the tendency, however, in his particular case, to generate calculous

matter, that it is very questionable whether he will not be liable, always, to its formation, unless by change of diet, water, and climate, he can effect such a change in his constitution as to get rid of the diathesis.*

<center>CASE II.</center>

At the request of Doctor Tyndale, a respectable practitioner, whom I had the pleasure of meeting during a visit of a few days at the White Sulphur Springs, of Virginia, in the summer of 1835, I saw, in consultation with him, W. T., Esq. of Pitt-sylvania. Believing, from the symptoms, that the patient had stone in the bladder, I was induced to sound him, and discovered a calculus of considerable size, under which he had laboured, in all probability, for several years. From this and other causes, his health had been long impaired and his constitution irritable. In some respects, however, his case appeared to be adapted to *lithotripsy*, but totally unfit for *lithotomy*. Having my instruments with me, and wishing to ascertain whether the stone was hard or soft, I prevailed on Mr. T. to submit to the introduction of the lithotripteur of Heurteloup; and although the bladder had not been fully distended with water, or the patient prepared by diet for the operation, I succeeded in detaching small portions of the stone, which were brought away in the gutter of the instru-ment, and which proved to be soft and mortar-like, but full of sharp, needle-like points. A slight chill and fever followed this attempt; from which, however, after a few days, no incon-venience resulted. I then took leave of the patient, and advised him to repair to Philadelphia the ensuing autumn and undergo the operation of *lithotripsy*, enjoining upon him at the same time the necessity of regular preparation, by appropriate diet, for several weeks previous to leaving home. Shortly after my de-parture from the Springs, Mr. T., from eating boiled corn and other unwholesome articles of food, had a violent attack of cholera morbus, and with great difficulty recovered from it. From that period his constitution became enfeebled, and he suffered more than ever from the disease in his bladder, passing occasionally

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* This patient, as predicted, had a return of his disease, and died some months after.

lumps of sabulous matter, like mortar in consistence, but full of so many sharp crystallized points as to create great pain and soreness in passing them. During the whole winter he remained at home, unable to set out for Philadelphia; but towards the spring, finding his health somewhat improved, made the attempt, and arrived, after encountering bad roads and very unfavourable weather, on the 27th of April, 1836, exhibiting great marks of fatigue and long suffering, and very much changed in appearance since the period I had first seen him.

Finding that Mr. T. had been making no preparation in the way of regimen to facilitate the operation of *lithotripsy*, and to guard against irritation and inflammation, I placed him at once in lodgings, as near to my own residence as possible, in order that I might watch him closely and be with him at a moment's warning in case of difficulty, impressing at the same time upon his landlord the necessity of the strictest attention to diet, &c. Having consumed nearly a month in subjecting him to dietetic discipline, and dilating the urethra by gum elastic catheters, I commenced regularly, May 24th, with the operation of *lithotripsy*; introduced Heurteloup's instrument, touched the stone, but could not seize it, owing to the small quantity of urine contained in the bladder, but which, notwithstanding, the patient informed me, had been collecting for several hours. From this operation no inconvenience followed, and the patient was ready on the 26th for another trial. The *lithotripteur* being introduced, the stone could not be felt, owing to the small quantity of urine contained in the bladder. To obviate this difficulty I withdrew the instrument, injected the bladder with tepid water, again introduced the *lithotripteur*, seized a portion of the stone, which readily crumbled beneath the pressure exerted upon it, and brought away small mortar-like fragments. Other pieces of similar appearance were discharged along with the urine in the course of the day. To facilitate the seizure of the stone upon this occasion, I found it necessary to introduce a finger into the rectum, and raise the stone from the fundus of the bladder, or the bed, or cyst, into which it had been accustomed, as I had reason to believe, to lurk. Four hours after the operation the patient complained of having a slight chill; this continued for an hour, and was followed by a little fever. These symptoms I thought might be attributed in part to the weather being uncommonly cold, raw

and damp, from the continued prevalence for some time of easterly winds. Towards night the constitutional symptoms passed away, and the only complaint the patient made was of unusual soreness along the urethra, which I accounted for by the passage of the mortar-like substance, armed with its crystallized points.

Upon visiting the patient next day, (27th,) I found him complaining of desire to evacuate urine every twenty minutes, and of a discharge of ropy mucus of yellowish tint. These symptoms continued throughout the day, more or less, and were unabated on the next day, (28th,) which induced me to order the hip-bath and 30 drops of black drop, and a weak opiate injection per anum. Under the influence of these, Mr. T. slept soundly until 3 o'clock, P. M. During the afternoon, however, more or less of drowsiness continued, and the desire to make water had nearly ceased, and so remained throughout the night, but in the morning (29th) returned with its former urgency. To combat this as soon as possible, the opium was again resorted to, both in form of injection and black drop, internally. In the afternoon, also, an aloetic pill was administered, and a blister applied to the sacrum. Under the influence of these the patient passed a good night, almost undisturbed by spasms. On the next morning, (30th,) the desire to pass urine, accompanied by spasms, returned and continued all day, at intervals of fifteen or twenty minutes. At five o'clock, P. M., a suppository, consisting of three grains of cicuta and two of opium, was administered. At eight o'clock, P. M., the pulse, for the first time, became full and bounding, owing to too much nourishment (consisting chiefly of raw oysters) having been taken, and to the room being filled with the gas of anthracite coal, which is as deleterious in its operation as that of charcoal. To remove these symptoms, the patient was bled to ten ounces. Notwithstanding the bleeding, the patient passed a restless night, and on the next morning (31st) the spasms returned with more violence than ever. In the course of the forenoon, a laxative enema was administered two or three times, and produced copious evacuations. At 3 o'clock, P. M., it became necessary, on account of frequency of alvine discharges, to administer an opiate enema. This checked the diarrhœa and spasms for the night, but in the morning (June 1st) the spasms returned again, and continued with more or less violence through-

out the day. Various remedies, besides the opiates and other means detailed, were tried ineffectually, and, although the symptoms varied from time to time, the spasms and pain in passing urine were the prominent ones, and came on at last with such violence, and at such short intervals, as to prostrate the patient beyond the possibility of recovery. Two days afterwards (June 3d) he died. Permission could not be obtained to examine the bladder and its relations, a circumstance much to be regretted, especially as lithotripsy is still in its infancy and requires all the light that can be shed upon it. But, although denied the opportunity of examining the condition of the bladder, and of ascertaining *positively* the cause of death, there are several circumstances connected with the case exceedingly well calculated to unravel a part of the mystery. From the history of it I have detailed, it will be seen that extraordinary pains were taken to prepare the patient for the operation, by restricting his diet in every possible way—by confining him to his room, and by the use of instruments calculated to enlarge the urethra and accustom it afterwards to those to be employed for the destruction of the stone. Unfortunately, however, the interesting sufferer was not aware of his own danger, and with the best possible intentions, in deceiving me in what he supposed to be little matters of no moment, he deceived himself, and led to results which I am very confident would not otherwise have followed. Instead, then, of attending *strictly* to the regimen I had prescribed, (as I have since ascertained from the best authority,) instead of living entirely on barley-water, black tea, dry bread, and rice, and avoiding altogether animal food during the entire month of preparation preceding the operation, his meals were taken with the family with which he lived, and every article on the table he happened to fancy freely indulged in. This course, together with undue exercise, either in his room or abroad in the streets, was calculated, as I am sure every experienced surgeon will admit, to produce the worst effects, especially in a patient advanced in years, of irritable constitution—one who had long suffered from violent attacks of other diseases—whose bladder had been thickened and contracted by the lodgement, for years, of a large stone—whose kidneys, in all probability, were also diseased, besides other organs, more or less important in the animal economy. I trust it will not be supposed that I mention

these facts by way of exculpation or for the purpose of casting a veil over any errors I may have committed. Those who know me, I think, will acquit me of such intentions. Nor would I have it supposed that I am casting unjust and unnecessary censure upon the respectable patient for whom I felt the highest personal regard and respect, and in whose case I took the most sincere and lively interest. My only motive in detailing such circumstances, is the public good, and for the benefit of those who may be now engaged in treating similar cases, or who may do so hereafter; for there is nothing more likely, than that patients similarly situated with Mr. T., (who from having always been accustomed to plentiful and luxurious living—to all the comforts and delicacies of life,) will not voluntarily refrain from such enjoyments, especially if they can persuade themselves that the indulgence in them cannot interfere, materially, with their complaints and the mode of treating them.

CASE III.

At the request of Dr. Joseph G. Nancrede, I saw, in consultation with him, in April, 1836, Mr. Charles O'H., sixty-three years of age, who, for the last few years, had led a sedentary life, and complained, latterly, of symptoms of stone in the bladder. Upon sounding the patient, a stone of large size was distinctly felt, both by Dr. Nancrede and myself, and the case pronounced, in every respect, suitable for *lithotripsy*. The patient having consented to the operation, was accordingly prepared for it, by being placed on a diet of rice, barley-water, and black tea; very little time, however, was required for this purpose, inasmuch as he had abstained, for some time previously, from animal food, by advice of Dr. Nancrede.

On the 1st of May, I commenced the operation in presence of Dr. Nancrede, and Dr. J. Y. Hollingsworth of Maryland, by introducing a large silver catheter, and injecting the bladder with tepid water, until the patient complained of uneasiness from a sense of distension. The catheter was then withdrawn, and the *lithotripteur* of *Heurteloup* introduced, but the stone not felt until the patient turned a little on his side; I then perceived it to roll over the instrument heavily, which convinced me, at once,

that it was large. Upon placing the patient on his back, and elevating his hips with pillows, the heel of the lithotripteur came in contact with the stone, which was readily seized, (though not until I had expanded the blades of the instrument beyond an inch and a quarter,) and by a few turns of the tripod, broken it into several large fragments, the cracking of which, as they were rent asunder, could be distinctly heard. During these manœuvres the patient remained perfectly still, experienced not the slightest uneasiness, except that arising from over-distension of the bladder, and was conversing, cheerfully, during the whole operation, which did not exceed in duration five minutes. Upon withdrawing the *lithotripteur*, and directing the patient to stand up and evacuate his urine, numerous small fragments were discharged, besides those contained in the blades of the instrument. The catheter being again introduced, and the bladder injected, other fragments were brought away. Neither pain, chill, nor fever followed the operation; the fragments, in small quantity, continued to pass away, but not with as much rapidity as if the muscular powers of the bladder had been greater.

On the 16th of May, I repeated the operation, in presence of Drs. Nancrede and Horner, seized, without difficulty, fragment after fragment, and fractured them, without giving the patient any pain whatever, except upon withdrawing the instrument, which, from being a little clogged with pieces of the stone, produced slight irritation at the external orifice of the urethra. No constitutional disturbance followed, and the patient, as heretofore, passed again small fragments.

May 19th, in presence of Drs. Nancrede, Hays, Caldwell, and Bush of Kentucky—Cabell, of Virginia, and several medical students, I renewed my attempts upon the fragments of Mr. O'H.'s stone, with the success I had hitherto met, and without the operation having been followed by a single unpleasant symptom. Fewer fragments, however, than usual, passed away, immediately after the operation, and for several succeeding days, owing to continued inactivity of the bladder, or want of muscular power.

24th, in presence of Dr. William Crump, a distinguished physician of Powhattan County, Virginia, Drs. M'Crea, Stewardson, Pennebaker, Smith, Mr. W. Tunstall, of Virginia, and many medical students, I performed upon Mr. O'H. the operation

he had, upon former occasions, undergone. Previous to com-
mencing it, however, it was necessary to remove a fragment
from the urethra, which lodged about an inch behind the glans
and was easily removed by a bent probe. Several of the frag-
ments in the bladder, notwithstanding the former operations,
measured, by the graduated scale, half an inch, and even three-
quarters. These were distinctly heard to crack, by several of
the gentlemen present, under the pressure of the tripod. This,
like the former operations, was followed by no unpleasant
occurrence.

29th. (Drs. Nancrede, W. P. Johnson, and J. Wallace being
present,) I performed lithotripsy for the fifth time on Mr. O'H.,
and without injecting the bladder seized upon fragment after
fragment, and instantly reduced them to pieces so small, that
scarcely a particle could be caught larger than a quarter of an
inch, though in the commencement of the operation, two or
three fragments, exceeding half an inch in size, were met with.
As usual, the patient bore the operation without a murmur.
Several fragments and a good deal of debris came off in the
blades of the forceps. But several days elapsed, after this
operation, before any pieces of consequence were discharged
with the urine. Early in the morning, however, on the 1st of
June, I was sent for to remove a fragment that blocked up the
urethra near the neck of the bladder, which I thought best to
push back with a catheter.

June 12th. Accompanied by Drs. E. Peace, and W. B. John-
son I again visited Mr. O'H., introduced a large silver catheter
and drew off a small portion of urine, which the patient could
not expel by his own efforts, injected the bladder with tepid
water, and introduced the lithotripteur of Heurteloup with a
view of crushing any fragments that might remain, but, much to
my surprise, found that none could be detected ; not satisfied,
however, with this examination, I determined to explore the
bladder with the common sound ; but still with the same result.
This was accounted for by examination of the bottle containing
the discharged pieces, which had accumulated since the last
operation, (May 29th,) so considerably, as to add largely, to the
portions previously expelled, and which, taken collectively, from
first to last, would have been sufficient to form a stone of the size
of a walnut, and one much larger might have been formed, if the

patient had taken pains to collect all the pieces—but owing to inaccuracy in this respect, a great deal of sand and numerous fragments, there is reason to believe, must have been lost. As usual, no inconvenience resulted from this examination; but, four days afterwards, (June 16th,) I was sent for, early in the morning, to visit the patient, who felt alarmed at the idea of a fragment being lodged in the urethra ; such, however, upon passing the instrument, I could not discover, and, therefore, concluded that irritation had been created by the patient having changed his diet too suddenly, after having been told that he was nearly rid of his calculus. Upon this occasion, indeed, I found him over a large bowl of coffee, and surrounded by piles of bread and butter. By directing him to resume his tea and barley-water, all uneasiness about the bladder and urethra disappeared in a few hours. On the 20th of June, I paid him another visit, and found him complaining of slight tenderness in one testicle and a pricking sensation in the urethra. Suspecting the lodgement of a fragment, I introduced a pair of small forceps and extracted a piece about a quarter of an inch in length.

In the presence of my friend, Dr. Norcom, an eminent physician of North Carolina, Dr. Chase, Dr. Nancrede, and Mr. Schively, I repeated the operation to-day, (June 29,) on C. O'H., by injecting the bladder, introducing the lithotripteur, and searching for the stone ; but, after moving the instrument in every direction, within the bladder, I could not touch a fragment. The lithotripteur was withdrawn, and the patient rose and passed his urine. It then occurred to me, that by sounding the patient with the bladder *empty*, I might be able to feel the stone and crush it. Upon so doing, accordingly, a fragment about half an inch thick, was distinctly felt, and almost immediately seized and demolished. Another was also caught, and as readily destroyed. In the groove of the instrument, as usual, portions of mortar-like matter were found. Fully convinced, from the accurate examinations made at different periods, that the fragment destroyed to-day was the only one the bladder contained, I felt very confident that the patient would soon be entirely rid of his complaint. For the last eighteen months he has been perfectly well.

CASE IV.

H. M., of Virginia, thirty-four years of age, arrived at
Philadelphia on the 29th of April, 1836, and consulted me on
his case, which, in some points of view was a singular one.
According to the patient's statement, a persimmon-seed had
been introduced into his urethra, and found its way into the
bladder, where, in all probability, it had served as a nucleus for
a stone ; for, in a short time after, symptoms resembling those
of stone, were manifested.   Upon sounding the patient, I dis-
covered a calculus of small size, and—judging from the feel
communicated to the sound—of soft consistence.   Anxious to
undergo *lithotripsy*, or lithotomy if I preferred it, he was placed,
at once, upon appropriate diet, directed to drink plentifully of
diluents, and while pursuing this course, had the urethra dilated
with bougies, catheters, &c.   After persevering in this system
for three weeks, the patient became extremely desirous of sub-
mitting to the operation itself, and, as he possessed considerable
mechanical skill and ingenuity, and had examined with great
curiosity the instruments for lithotripsy, expressed a decided
preference for that of *Jacobson*.   To gratify him, therefore, it
was employed, and, with the utmost caution and gentleness,
attempts made to seize the stone ; but, so great was the irritation,
and so severe the spasmodic action of the bladder, induced by
its presence, that it appeared to me it would have been forcibly
expelled from that viscus.   I was obliged, therefore, to withdraw
the instrument, after the lapse of a few seconds.   This attempt
was followed by severe chill and fever, which confined the
patient for several days.

On the 26th of May, I commenced, regularly, with Mr. M.,
and, at his request, again employed the instrument of *Jacobson*,
notwithstanding the suffering it had previously occasioned him.
Accordingly, it was introduced, but created so much pain
and inconvenience that he peremptorily demanded its removal.
Upon withdrawing the instrument, the urine which had been
retained three or four hours, escaped, and rendered it neces-
sary, before proceeding further, to inject the bladder with
tepid water.   After this, the *lithotripteur of Heurteloup* was
introduced, and the stone almost immediately seized and

crushed under the pressure of the tripod or screw—creating a
sound similar to that of chalk, when broken between the fingers.
In the groove of the instrument, numerous small fragments
were found, and, in course of the day, several large pieces dis-
charged along with the urine, some of which were encrusted
with a dark brown or black skin, similar to the husk of a per-
simmon. The stone, as I had predicted, was of rather soft
consistence, and apparently composed of the ammoniaco-mag-
nesian phosphate. Before the completion of the operation, the
patient suffered a good deal from pain and spasm of the
bladder, but these soon ceased, and were not followed, as in
the former attempts, by chill and fever. Two days (May 28th)
after the operation, however, the patient complained of great
pain in the urethra, but was suddenly relieved by the discharge
of a large fragment, in the centre of which was a hollow or
depression, corresponding in shape and size with a persimmon-
seed.

On the 29th, another fragment was discharged, but, as no
other made its appearance from that period until the 6th of June,
I introduced on that day, in the presence of Dr. Saltmarsh, the
instrument of *Heurteloup*, and used it as a sound, but could not
detect any portion of stone. However, the next day, (June 7th,)
a fragment half an inch long, and hollowed out in the centre,
passed off with the urine. At the same time, a portion of black
skin resembling the rind of a persimmon was thrown off. On
the 9th of June, the lithotripteur was introduced, but without
detecting a fragment. The same operation was repeated four
days after, (June 13th,) in presence of Drs. Johnson and Peace,
but with no better success. Having experienced no incon-
venience from the two last examinations, another was made
(June 17th) in presence of Dr. Saltmarsh, and a fragment about
the size of a bean felt at the fundus of the bladder, which was
readily caught and crushed. In the course of the day, three
oblong fragments, a quarter of an inch thick, passed away with
the urine. With the view of ascertaining whether other frag-
ments still remained in the bladder, the *lithotripteur* was again
introduced, (June 20th, Dr. Saltmarsh being present,) but nothing
could be felt. Soon after this examination, the patient changed
a pair of cloth pantaloons for thin ones, and walked about the
streets for some time, and, when he returned to his lodgings,

was seized with chill, followed by a high fever, which rendered
it necessary to bleed him and restrict his diet more than ever.
Since that period he has been confined to his room with sore
throat, cold and more or less fever, which, for the present,
prevent the operations from being continued. That any frag-
ment of stone remains in the bladder, seems to me extremely
doubtful; it is more than probable, however, that the *persimmon-
seed* is still there, inasmuch as no portion of the *substance* of
the seed has yet been discovered, and, as he complains, after
passing urine, of something presenting itself at the neck of the
bladder. Whether the *lithotripteur* will be able to destroy the
texture of such a substance,—which closely resembles softened
horn,—I am at a loss to say. In truth, until I saw the pieces
of black skin discharged along with the fragments, I did not
believe that such a foreign body had found its way to the bladder,
and had placed the patient's account of the mode of its getting
there to the effect of imagination.

On the 28th of June, the patient having recovered, in a great
measure, from the effect of his cold, another examination was
made with the *lithotripteur,* but smaller in the shaft and shorter
in the beak than the one commonly employed. This did not
enter with facility, but met with considerable obstruction at
the neck of the bladder; it finally started forward, very sud-
denly, and was completely introduced. Some hours after, the
patient discharged, along with the urine, more or less venous
blood, the result, no doubt, of the pressure of the short beaked
instrument upon the prostate and neck of the bladder. To-day
(June 29th) the urine is colourless and the patient free from
soreness in the urethra, and, as the weather is becoming warm
and oppressive, and he complains of being weakened and
reduced, I have advised him to postpone further operations for
the present, and retire for a few weeks to the country. In
the following autumn he returned to town and submitted to
two or three more operations, and was soon perfectly cured,
—by the removal of the persimmon-seed,—and has so remained
ever since.

* CASE V.

P. P., Esq., about forty-eight years of age, of literary and sedentary habits, troubled more or less with dyspepsia, came to Philadelphia in 1835, by advice of my friend, Dr. Thomas, a distinguished physician of Westchester, to consult me about symptoms resembling those of stone in the bladder. His engagements, however, at that period, were such as to prevent him from being sounded, and from remaining in town. About the middle of May, 1836, he returned to Philadelphia, and upon sounding him I discovered a stone, and concluded from its ringing distinctly when struck by the sound, that it was a hard one. Believing the case adapted to *lithotripsy*, I advised the operation, placed him in suitable lodgings, and commenced a *system of diet*, which, indeed, he himself had been observing, in a measure, for some time before, having anticipated the necessity of such a course. After using, also, gum elastic and other instruments to familiarize the urethra with such guests, I commenced the regular operation, (May 21,) by introducing *Jacobson's* instrument, which, however, gave excessive pain, brought away blood, created severe chill and fever, and rendered the patient so ill as to induce me to advise him to return to the country after the symptoms had abated, and remain until he recovered sufficiently to undergo a trial with another instrument. Accordingly, he left town on the 26th of May, and returned on the 4th of June, improved in appearance and health.

On the 8th of June, I introduced the *lithotripteur* of Heurteloup; and after searching for the stone a few seconds, discovered, seized, and fractured it, as it lay in the fundus of the bladder on its right side. During the turning of the screw, the fragments could be heard cracking distinctly, the report being very sharp and sudden, like that of a distant whip. Upon removing the instrument, numerous small fragments were found in its claw and gutter, of a yellowish or gamboge tint, intermixed with harder portions of dark brown fragments; which from appearance I should suppose were made up of oxalate of lime and lithic acid. During the operation the patient scarcely complained of pain, and remarked that the uneasiness arose more from sense of distension, from having retained his urine two or

three hours previous to the operation, than from the instrument. Neither chill nor fever followed this operation; and the next day sand and several small fragments were discharged with the urine.

On the 14th of June, the patient felt well enough for another trial, which was accordingly made, and with the same happy result—the stone having been seized instantly and crushed with an audible noise. Numerous fragments came away in the groove of the *lithotripteur*, and the next day three larger than a pea were discharged along with the urine—the whole collection, from the two operations, being sufficient, if put together, to form a stone the size of a large almond. During the operation, the patient did not complain of pain or spasm of the bladder; more or less of which last he had usually experienced while the instruments remained in that organ.

On the 17th I visited Mr. P. again, (accompanied by Drs. Peace, Chase, and Johnston,) with the view of searching for fragments; but the patient not having allowed the urine to collect in sufficient quantities to seize them with safety, I declined the operation, but merely used the *lithotripteur* as a sound, to determine the size and situation of the pieces.

On the 22d of June, in presence of Dr. Saltmarsh, I made another examination, but without being able to detect a fragment, and repeated the effort on the 25th and 29th, but with no better success. That there is still a fragment in the bladder, however, is rendered probable by the circumstance of the patient feeling an obstruction occasionally, about the neck of the bladder, after walking or remaining for some time in the erect position, an obstruction sufficient to impede the flow of urine for a moment, or until removed by a change of position. But the patient's engagements are such as to prevent him from staying longer in town at present; and as he is desirous of recovering, also, from the effects of his restricted system of living, he returns to his farm, and, after harvest, intends to have the bladder still further explored. He came back, accordingly, after the lapse of a few weeks, and by one or two more trials with the lithotripteur, was restored to perfect health, and so continues to the present time.

The above account of lithotripsy was published, two or three years ago, in the American Journal of Medical Sciences, and has been transferred to these pages with few alterations. Since

that period I have not had occasion to vary much the opinions I then formed on the subject. The instruments, however, which I at first employed I have altered, more or less, to suit my convenience, especially the beak of the lithotripteur—by enlarging, considerably, the opening, or slit, near its heel, to permit the free passage of fragments. Other cases I could here detail, if necessary, in proof of the advantages of Heurteloup's over other instruments, especially trials I have seen made with it in Paris by Civiale and Leroy D'Etiolles. Its reputation, however, is now so well established, as to render such details unnecessary. I cannot avoid mentioning, however, that a great improvement has been made in the instrument by Civiale, especially by shortening and widening the beak, to enable the operator to pick up fragments with the more facility.

On Lithotripsy consult Case of Lithotripsy successfully performed by L. Deypere, in New York Med. Journal for Nov. 1830 ; The Operation of Lithotripsy, by Jacob Randolph, M.D. in Amer. Jour. of Med. Sciences, No. xxix. Nov. 1834, and in subsequent numbers of same journal; Parallele des divers moyens de traiter les Calculeux, &c. &c., par le Docteur Civiale, Paris, 1836 ; De La Lithotripsie, par Leroy D'Etiolles, Memoire, No. i., Paris, 1836; Lithotripsie, Memoires sur La Lithotripsie, par percussion, et sur l'instrument appelé percuteur courbe a marteau, qui permet de mettre en usage ce nouveau systeme de pulverization des peirres vesicales, &c. &c., par le Baron Heurteloup, Paris 1833.

CHAPTER X.

DISEASES OF THE EYE.

THE eye, from its delicate and complex structure, and the number and diversity of its diseases, was formerly much neglected, especially in Europe, by the regular members of the profession, and attended to almost exclusively by ignorant and itinerant oculists. Within the last thirty years, however, the value of this important branch of surgery has been duly estimated, in proof of which it need only be mentioned that Ware, Saunders, Gibson, of Manchester, Adams, Wardrop, Travers, Vetch, Lawrence, Guthrie, Middlemore, in Britain, and Scarpa, Beer, Schmidt, and others on the continent, have contributed largely by their writings and operations to elevate this department to a most respectable rank. Many of these gentlemen, indeed, forsaking the general practice of their profession, have devoted their whole attention to ophthalmic surgery, and with a result truly honourable to themselves, and glorious to their country.

It would be impossible in a work of this description, which, for the most part, may be considered a mere skeleton, to give an account of all the diseases of the eye ; diseases which are so numerous and important, which have occupied the exclusive attention of so many distinguished individuals in all countries, and upon which volumes have been written in all languages. All that can be done, then, is to present the most important in a condensed and tangible form, so divested of technicalities and intricacies, and so simplified in the treatment as to make them intelligible to the youngest student—reserving for the lectures the illustrations by diagrams and magnified drawings, through which alone the morbid appearances and more difficult operations can be shown and explained. To attempt, indeed, to

teach a class of four or five hundred pupils—which number for the last thirty years have, during many sessions, occupied seats in the University of Pennsylvania—by mere description, or by the exhibition of preparations of the eye of its natural size, would be irresistibly ridiculous.

The most common affection, perhaps, of the eye, is ophthalmia. Of this, therefore, it will be proper first to treat. Ophthalmia is employed by most modern writers as a generic phrase—denoting ocular inflammation. For the sake of precision and accurate discrimination, other terms have been invented, some of them simple and expressive enough, others formidable in the extreme, or altogether monstrous.* To elucidate the varieties of the disease, I shall not follow the exact arrangement of any individual author, but endeavour to simplify as much as possible, and oppose every distinction which is not perfectly clear and obvious.

* Nothing short of affectation or pedantry will enable us to tolerate, in many instances, the phraseology of Beer and Schmidt—such as opthalmo-blennorrhœa, blepharo-opthalmo-blennorrhœa, dacryoadenitis, blepharophalmitis idiopathica, anchyloblepharon, symblepharon, and a hundred more, either of which surpasses in complexity the old anatomical mouthful, bascochondroceratoglossus, &c.

SECTION I.

CONJUNCTIVAL OPHTHALMIA.

Conjunctival inflammation, to denote which some writers employ the word *ophthalmitis*, is the most common form of ophthalmia, and is characterized by the following symptoms—a sense of uneasiness, or itching, an impatience of light, diffused redness of the conjunctiva, pain, heat, and swelling of the globe of the eye, an epiphora or increased secretion of tears, a pungent pain, proceeding apparently from the lodgement of a particle of sand or some other extraneous body, but in reality from one or more bundles of enlarged vessels. To these symptoms are superadded, if the inflammation continues to advance, deep-seated, pulsatile and violent pain in the eyeball, which extends to the forehead, accompanied by fever and other general indisposition. Very often, moreover, the conjunctiva becomes thickened, and projects in a fungous form beyond the margin of the cornea. At other times blood is extravasated between the conjunctiva and sclerotic coat. In the still further advanced stages of the disease, suppuration is liable to ensue, followed by destruction of the cornea, evacuation of the humours, and abolition of sight. It is seldom, however, that a simple conjunctival ophthalmia terminates so unfavourably ; on the contrary, the symptoms gradually decline, and the eye is restored to its natural state, though sometimes the disease assumes a chronic form, and is then very difficult to manage.

The causes of conjunctival ophthalmia are, for the most part, exposure to extremes of cold and heat, sleeping in the open air, without cover, too intense and vivid a light to the eye, whether direct or reflected, blows, wounds, irritation from the lodgement of extraneous bodies upon the globe, or between the eyelids, disorder of the digestive organs, &c.

Catarrhal ophthalmia is a variety of conjunctival inflammation exceedingly common on the continent of Europe, and sometimes

met with in this country. It is frequently epidemic, and occasionally accompanies influenza. It is marked, in the early stage, by a peculiar dryness of the eye and eyelids, and by a pungent pain near the caruncula lachrymalis. In a few days these symptoms diminish, and are followed by a copious flow of tears, and a mucous discharge, which is generally so acrid as to excoriate the eyelids and adjacent parts of the cheek. The patient is scarcely ever free from fever. In severe cases of the disease the whole conjunctiva is covered with small pustules, containing purulent matter or a yellowish serous fluid.

Purulent ophthalmy differs from the catarrhal in many respects. It is a very formidable and destructive disease, and sometimes destroys one or both eyes in the course of a few hours. Adults, as well as children, are liable to it, but especially the latter. It usually commences four or five days after birth, by a slight redness and tumefaction of the conjunctiva lining the eyelids. This is speedily followed by the secretion of a thin adhesive matter, which glues the lids together. In a few hours the discharge becomes very copious, thicker in consistence, acquires a yellowish or greenish cast, and is so acrid as to excoriate the cheeks. From the lids the inflammation extends to the conjunctiva covering the ball of the eye, and the whole membrane is converted into a thick fungous mass; which, when the eyes are opened, projects beyond the lids, and obscures the cornea. If the disease should continue to spread, the cornea is next involved, and either ulcerates or sloughs, the humours are discharged, and the eye lost. A great deal of constitutional irritation attends the early stage of the disease, but this subsides in three or four days, and the ophthalmia then assumes a chronic form.

To assign any satisfactory explanation of the origin of purulent ophthalmia is very difficult. Some writers suppose it to be closely allied to the gonorrhœal ophthalmia, others that it proceeds from leucorrhea; the matter of which, in both instances, is applied, it is imagined, to the eyes of the child during its passage through the vagina. Mr. Saunders is inclined to believe that the inflammation is of the erysipelatous kind.

Gonorrhœal ophthalmia, another variety of conjunctival inflammation, bears a striking similitude to purulent ophthalmy, that form of it especially which is so prevalent in Egypt and

other eastern countries, and from which the British and French troops, a few years back, suffered so severely. The symptoms, however, are, in every respect, more vehement, and such as to terminate almost invariably in the loss of one or both eyes. That it follows, in many instances, the direct application of the gonorrhœal virus, I have the strongest proofs; having had, at different times, patients under my care in whom the disease was produced by the practice, so common among the vulgar, of washing inflamed eyes with urine. There is reason to believe, also, that the disease is sometimes induced by sympathy or a metastasis, in consequence of suppressed gonorrhœa.

Scrofulous ophthalmy, a disease very common amongst scrofulous children, may be distinguished from other affections of the conjunctiva by a peculiar morbid irritability of the eye, or intolerance of light, unaccompanied with pain, which obliges the patient to keep the lids constantly in a half closed state, and confine himself altogether to a dark room. In addition to this, numerous distinct vessels may be seen running towards the cornea, some of which pass to the centre of that tunic, and terminate in a small pustule or ulcerated spot. This disease may continue for months together, without much alteration, and is very apt to be followed by corneal specks.

TREATMENT OF CONJUNCTIVAL OPHTHALMIA.

In the early stage or acute form of simple inflammation of the conjunctiva, the disease may be removed, in a short time, by general and local blood-letting, mild purgatives, nauseating doses of antimony, low diet, blisters behind the ears, or on the back of the neck, lotions of tepid water, a solution of opium, or of the acetate of lead. If, in spite of this treatment, the inflammation should not terminate, but runs into the chronic stage, cold astringent washes and stimulating ointments may then become necessary, such as the vinous tincture of opium, the citrine ointment, the ointment of the red oxide of mercury, &c.

For *catarrhal* ophthalmia the best remedies are moderate depletion, at first, and afterwards highly stimulating collyria and ointments.

Purulent ophthalmia, in the commencement, should be treated

upon common antiphlogistic principles, and by moderately as-
tringent washes, introduced into the eye by means of a syringe.
The best lotion for this purpose is the undiluted liquor of the
acetate of lead.   In advanced stages of the disease, an infusion
of two drams of the leaves of tobacco in eight ounces of water,
was found highly serviceable by Mr. Vetch, in restraining the
discharge, relieving pain and removing watchfulness. The aqua
camphorata of Bates's Dispensatory has been praised as ex-
tremely efficacious in the chronic form of purulent ophthalmy.
I have often tried it, however, without benefit, and sometimes
with manifest aggravation of the symptoms.

  Gonorrhœal ophthalmia, unfortunately, admits of no relief;
at least, in several instances of the kind which have fallen under
my care, and in others which have occurred in the practice of
Dr. Physick, no benefit whatever has resulted from any mode
of treatment that could be devised.   Mr. Vetch, however, with
great confidence states, that the disease may be certainly cured
by those remedies adapted to the treatment of Egyptian oph-
thalmia.

  Scrofulous ophthalmy seldom requires antiphlogistic measures;
on the contrary, a tonic plan of treatment will generally be
indicated.   In the commencement of the disease, however, it
may be necessary to purge the patient, regulate strictly his diet,
order warm clothing, moderate exercise in the open air, &c. To
alleviate the intolerance of light, which is so much complained
of by all patients in this disease, a blister at the back of the neck,
kept open by savin cerate, will be found the best remedy.   Some-
times the internal use of mercury will be required.   The best
collyria are those composed of weak solutions of the argentum
nitratum, of sulphate of zinc, alum, &c.

SECTION II.

SCLEROTIC OPHTHALMIA.

An inflammation of the sclerotic coat, described by many writers under the name of *rheumatic* ophthalmia, is often met with. That it is closely allied to rheumatism is exceedingly probable, both from the circumstance of its being a frequent concomitant of that disease, and from the nature of the texture which it occupies. The pain in the commencement of the disease, is generally seated in the temple, and extends thence to the eyebrow, cheek and eye of the affected side. It is constantly present, but commonly most severe during the evening and late at night. The eyeball itself, when examined, does not present the common appearances of conjunctival inflammation. There is no purulent discharge, nor does the patient complain of intolerance of light. The vessels, moreover, instead of following a tortuous course, run in parallel lines upon the sclerotic coat, and terminate at the margin of the cornea. These vessels are small and very numerous, and from being distributed over the whole albuginea, give it a uniform red colour; the redness, however, is not of the bright scarlet or vermilion hue, but of a dingy, brick-dust tinge. More or less fever, and derangement of the digestive organs, generally accompany the disease; and in bad cases, the inflammation may run so high as to involve the cornea and destroy the eye.

TREATMENT OF SCLEROTIC OPHTHALMIA.

The chief indications in the treatment of this disease, are to restore, by means of emetics and purgatives, the functions of the stomach and biliary organs, or, if the inflammation has been induced by exposure, to excite the skin by antimonials. Afterwards bark may, perhaps, be employed with advantage. The best local applications are a blister behind the ears, and the free use of the vinous tincture of opium as a collyrium.

General, as well as local blood-letting will, in certain cases of this disease, prove serviceable, but in others injurious. Hence the variety of opinions entertained on the subject by different surgeons; some contending that the depleting system should never be pursued, others, that it is indispensable. When accompanied by a full pulse, and met with in plethoric patients, general blood-letting, leeches to the temple, or forehead, or around the eye, will almost always relieve the pain and other urgent symptoms; but when the complaint occurs in thin, and debilitated subjects, has been of long standing, or connected with general rheumatism, little or no benefit may be expected from venesection. Opiate frictions to the temples are extolled by Beer and other oculists, and belladonna to the eyelids and superciliary ridges. Applications to the ball of the eye, with exception of wine of opium, so useful in other forms of ophthalmia, are seldom of much service in this variety of the complaint.

SECTION III.

IRITIC OPHTHALMIA.

THE term *iritis* was employed by Mr. Saunders to denote a variety of ophthalmic inflammation which previous to his time had been very little attended to. From the peculiarity and distinctness of the symptoms, there can be no question as to the propriety of considering the disease purely an inflammation of the iris, and totally independent of every other species of ophthalmia. The symptoms are severe lancinating pain extending from the eyebrow to the orbit; and shooting thence through the globe of the eye towards the optic nerve, extreme impatience of light, and an extraordinary morbid sensibility of the eye. Unlike most other varieties of ophthalmia, iritis is unaccompanied by redness of the conjunctiva, but the sclerotic coat is covered with numerous red vessels, which are particularly conspicuous on that portion of it connected with the margin of the cornea. On the iris, also, at least on its anterior surface, red vessels may be distinctly seen; but the most remarkable change that this membrane undergoes, is the loss of its brilliancy, and a change from its natural colour to that of a reddish or greenish hue. At the same time the pupil becomes contracted and irregular, and its edge is turned backwards towards the crystalline lens. Instead of terminating in suppuration, the inflammation generally stops at the adhesive stage, and lymph is deposited upon the outer surface of the iris in one or more spots, and is sometimes secreted so copiously as to fill the anterior chamber. From this cause, incurable obliteration of the pupil often ensues.

The causes of iritic ophthalmia are various. Sometimes the disease is induced by exposure of the eye to intense or vivid light; sometimes it proceeds from wounds of the iris made by the cornea knife or couching needle; at other times it appears to arise from some constitutional affection, such as gout. In the greater number of instances, however, it is the result of syphilis or of the abuse of mercury.

TREATMENT OF IRITIC OPHTHALMIA.

The antiphlogistic system, carried to its full extent, will barely prove sufficient, in many instances, to arrest the progress of this severe disease. Hence the propriety of resorting to it as speedily as possible after the inflammation has set in. To guard against obliteration of the pupil, by breaking up the bands of coagulable lymph which extend across it, the extracts of belladonna or stramonium will be found immensely serviceable. They should be applied to the outer surface of the eyelids, or over the eyebrows, two or three times a day, and kept on for half an hour at a time. Care should be taken, however, not to employ them during the height of the inflammation. For the removal of *syphilitic* iritis, the moderate use of mercury, followed up by sarsaparilla, will generally prove an efficient remedy. For other varieties of iritis, also, mercury will often be found indispensable, and is chiefly useful in preventing the absorption of lymph, and even in preventing its deposition. Cantharides and oil of turpentine, as local applications to the forehead and temples, are likewise useful. Quinine in chronic iritis is sometimes employed advantageously,

SECTION IV.

PSOROPHTHALMIA.

SOME of the German writers understand by psorophthalmia, a variety of inflammation of the eyelids, induced by psora or itch. In the usual acceptation of the term, however, nothing more is implied than simple inflammation or ulceration of the lids, whether induced by smallpox, measles, scrofula, erysipelas, sties, or any other cause.

Children, particularly those of scrofulous constitution, are very subject to this disease; adults, however, are not exempt from it. The inflammation first appears on the edges of the lids, and extends thence along the conjunctiva towards the globe of the eye. The pain is sometimes very severe, and the redness considerable, but the most distressing symptom is the intolerable itching, to relieve which the patient is obliged constantly to rub the affected part; and in this way only aggravates the disease. Sometimes the inflammation runs so high as to terminate in suppuration. This is followed by troublesome ulceration of the tarsi, and frequently by great deformity. The Meibomian glands are always more or less affected in this complaint, and pour out an adhesive fluid, that glues the lids together during sleep. To open these, in the morning, some force is usually employed, and this keeps up constant irritation, and frequently renders the disease chronic, causing the formation of small crusts or scabs along the tarsi and the cilia to drop out. In bad and long-standing cases of the disease, the puncta lacrymalia are sometimes permanently obliterated, and an incurable epiphora is produced.

TREATMENT OF PSOROPHTHALMIA.

In the early stage of this disease, purgative medicines and a moderate diet will contribute very much towards a speedy cure.

Weak solutions of the acetate of lead, of the sulphate of zinc, or sulphate of copper, will also be found useful as collyria. To prevent the lids from adhering, a very important indication in the treatment, a little fresh cream or butter should be placed between them every night before the patient retires to rest. After the inflammation has, in a measure subsided, and is verging towards the chronic stage, the unguentum hydrargyri nitrati, applied to the edges of the lids, two or three times a day, will prove singularly useful in relieving the itching, and in healing the ulceration. With the same view, an infusion or decoction of the pith of the sassafras is sometimes used, and in many instances with decided advantage. Not unfrequently the disease resists, for a long time, every remedy, and, indeed, continues for years together. Under these circumstances, blisters behind the ears and neck, and a course of mercury may prove useful.

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SECTION V.

PTERYGIUM.

THE pterygium, or eyewing, is a thin membranous expansion seated upon the conjunctiva. It commonly occupies the inner angle of the eye, in the shape of a triangle, the apex of which looks towards the cornea. The disease is very common, but in most instances productive of so little inconvenience, that many persons are subject to it for years together, without being aware of its presence. In the early stages, it resembles a globule of fat, and appears to possess little vascularity; a slight cold, however, or an inflammation of the conjunctiva, renders its vessels very distinct. Although the disease may remain stationary, or nearly so, for many years, it is always liable to increase, and in this case may extend over the surface of the cornea. But it is somewhat remarkable, that it seldom, if ever, passes beyond the semidiameter of the cornea. Sometimes a pterygium originates at each angle of the eye, and approaching the cornea in opposite directions, covers the whole of its surface. The disease is then called a pannus. There are two varieties of pterygium—the membranous and fleshy.

TREATMENT OF PTERYGIUM.

So long as this membranous excrescence continues small, and does not encroach upon the cornea, it will seldom be necessary to resort to an operation for its removal. When, however, it has attained considerable bulk, and is a frequent source of irritation, it should be dissected off either by a small scalpel or curved scissors. The scissors will generally be found the most convenient. To perform the operation advantageously, an assistant should stand behind the patient and support his head firmly

upon his breast, and with one or two fingers elevate the upper eyelid, whilst another assistant depresses the lower lid, and keeps it fixed. The surgeon then taking a pair of small forceps should elevate the pterygium from the conjunctiva, and by a few strokes of the scissors separate the whole of it from the globe. A smart and sometimes violent inflammation follows the operation, and this must be subdued by the usual remedies. Where the pterygium covers a part or the whole of the cornea, it will be impossible to restore the transparency of that tunic, however accurately it may be dissected from the surface. It is proper to know this, and to inform patients of it, in order to guard against disappointment and censure.

SECTION VI.

ENCANTHIS.

THE encanthis, an enlargement of the lachrymal caruncle and semilunar fold, is a very uncommon, but sometimes most malignant disease. It proceeds, in some instances, from obstinate and protracted ophthalmia; at other times the gland assumes a cancerous action, and terminates, like most diseases of this description—unfavourably. In every disease of the kind, whether benign or inveterate, the caruncula lacrymalis presents a granulated and livid aspect. In proportion, however, as the tumour increases, its surface becomes less rugged, and is covered with varicose vessels. From the caruncle the disease extends sometimes to the cornea, and along the inner surface of each eyelid. When the tumour attains a large size, the puncta lacrymalia are commonly compressed or obliterated, and a troublesome epiphora ensues.

TREATMENT OF ENCANTHIS.

Excision of the caruncula and of the valvula semilunaris is the only remedy for this disease; but the operation frequently fails, either from the whole of the tumour not being taken away or from the malignant character of the complaint. In performing the operation, the surgeon will find it most convenient to secure and control the tumour, by introducing a small hook into its substance, and then dissecting it out with a narrow scalpel. Care must be taken to avoid the puncta lacrymalia. If the tumour has taken on the cancerous action, is very large, and has involved the surrounding parts, it may become necessary to extirpate the globe of the eye.

SECTION VII.

OPACITY OF THE CORNEA.

THERE are three varieties of corneal speck, noticed by most writers under the names of nebula, albugo, and leucoma. By nebula is commonly understood a " superficial opacity of the cornea, preceded and accompanied by chronic ophthalmia, through which the iris and pupil are seen, and which does not, therefore, entirely take away from the patient the power of seeing, but only causes the surrounding objects to be seen as if covered with a veil or cloud."* The whole cornea is sometimes covered by a nebula; in other instances, several distinct specks appear in spots upon its surface, each of which is generally supplied with one or more vessels from the conjunctiva, or other coats of the eye. These vessels, indeed, serve to nourish or keep up the disease.

The *albugo* differs in several respects from the common nebula. It is more deeply seated and occupies the lamellæ or substance of the cornea; it is also of a white or pearl colour, is frequently unaccompanied by ophthalmia or by red vessels, and is always the result of an abundant effusion of lymph.

Leucoma is a dense callous speck of the cornea of a pure white or chalk colour, and polished aspect. It is usually the result of a cicatrix from a wound or ulcer. Sometimes it follows smallpox or measles.

TREATMENT OF OPACITY OF THE CORNEA.

A simple *nebula* or cloudiness of the cornea, may often be dispersed by slightly astringent collyria, such as are calculated to subdue the ophthalmia that usually accompanies the disease.

* Scarpa.

But, in many instances, a division of the vessels supplying the speck is rendered necessary. If the trunks are large, they should be elevated by forceps, and a piece taken out of each by the curved scissors.

The treatment of an *albugo* of long standing will always be found very difficult, and nothing short of highly stimulating applications will effect a cure. One of the best for this purpose is the unguentum hydrargyri nitrati, applied by means of a camel hair pencil to the surface of the speck once or twice a day. A weak solution of argentum nitratum, will, in most cases, prove very serviceable. The same may be said of sulphate of copper, and of corrosive sublimate. Red precipitate ointment, also, is a very useful remedy. Finely powdered loaf sugar, calomel, and other similar articles, are frequently blown into the eye, and produce most salutary effects. A drop of molasses between the lids night and morning, has frequently dispersed both nebula and albugo. In several obstinate cases of the disease which have resisted all the usual remedies, I have known a speedy absorption of the speck accomplished by the repeated ablution of the eye and eyelids with diluted vinegar. In addition to the local treatment, the internal use of calomel and other preparations of mercury should be resorted to. The *leucoma* is seldom, if ever, removed.

SECTION VIII.

ULCER OF THE CORNEA.

THE cornea, as well as the fine lamina of conjunctiva cover-ing its surface, is liable to assume the ulcerative action. In either case, a very troublesome, and, perhaps, destructive disease may be induced. This ulcer is commonly the result of the different varieties of ophthalmia, or it may proceed from the introduction of acrid or caustic substances into the eye. Sometimes the whole cornea is covered by the ulceration ; at other times, a small dimple-like cavity, not larger than the head of a pin, occu-pies some particular part of the cornea, and, instead of spreading towards its margin, penetrates the layers until it lays open the anterior chamber of the eye. An ash-coloured slough, resem-bling wet pasteboard, generally covers the surface of the corneal ulcer. The edges of the ulcer, also, are high and serrated.

TREATMENT OF ULCER OF THE CORNEA.

To relieve the excessive pain that usually attends this disease, and to promote healthy granulation, there is no application so effectual as the argentum nitratum. The sore should be lightly touched with the caustic, until an eschar forms on its surface, and when this drops off, which it generally does in twelve or eighteen hours, the application should be renewed—taking care to wash away with milk and water, any superfluous caustic that may happen to lodge about the eye or eyelids. When the ulcer assumes a healthy aspect, the caustic may be discontinued, and mild collyria or ointments substituted.

" In all cases," says M'Kenzie, " we endeavour, of course, to check the ulcerative process, by those measures which are fitted for subduing the inflammation in which the ulcer took its origin. So long as there is an appearance of activity in the inflammatory

disease, and much pain of the eye, local blood-letting must be employed. The bowels must be kept freely open, and opium administered in such a combination as shall be likely to operate on the skin. In strumous cases, sulphate of quinine operates very advantageously. In chronic superficial ulcer, calomel given so as to affect the mouth is sometimes necessary. In almost all cases of ulcerated cornea, counter-irritation will be found useful. As the inflamed state of the eye abates, the patient finds the pain greatly relieved, and we observe the ulcer clearing and beginning to contract."

SECTION IX.

STAPHYLOMA.

In the sense affixed to it by most modern writers, the term staphyloma implies a thickening and opacity of the layers of the cornea, together with a greater or less projection of the anterior surface of that tunic. Children, in whom the cornea is proportionably thicker than in adults, are most subject to the disease. One eye or both may be affected at the same time or in succession. Smallpox, purulent ophthalmia, wounds of the eye by the couching needle or extracting knife, blows, and other injuries, are among the most frequent causes of staphyloma. In the advanced stages of the disease, the tumour of the cornea is sometimes partially absorbed, and both the anterior and posterior chambers of the eye appear to be filled with a serous fluid. Two forms of the disease are met with—one in which more or less transparency of the cornea is preserved, and, along with it, a slight degree of vision; the other, in which the whole cornea is perfectly opaque. The former is denominated *partial*, the latter *total* staphyloma. Again; staphyloma has been divided into *conical* and *spherical*.

TREATMENT OF STAPHYLOMA.

There is no remedy, unfortunately, for this disease; at least the transparency of the cornea cannot be restored, and the patient, therefore, must for ever remain blind. But the surgeon, generally, has it in his power to alleviate the severe pain and inflammation (caused by dust and other extraneous bodies lodging upon the portion of the cornea projecting beyond the eyelids) by an operation. The object of this is to evacuate the humours, and permit the eye to collapse. To accomplish this purpose most effectually, and prevent a return of the disease, a section

of the most prominent part of the cornea, by the knife used for extracting the cataract, should be made. The humours having escaped, the flap of the cornea may be removed with curved scissors. A circular opening will thus be made large enough for the contents of the eyeball gradually to drain away, whereas, if the surgeon were merely to puncture the cornea with a needle, as formerly practised, the opening would soon close, and the disease return.

However, it has been recommended, and practised, by many modern oculists, not to evacuate the contents of the eye, if it can be avoided, but suffer the humours to remain, and endeavour to produce cicatrization of the cornea, in order that the rotundity of the eye may be preserved, and the deformity arising from the collapse of the organ obviated. With this view, all pressure upon the eye after the section of the corneal tumour must be avoided, the lids immediately closed by court-plaster, and not opened for several days. In *conical* staphyloma it is more difficult to prevent the humours from draining off than in the *spherical* variety.

SECTION X.

HYPOPION.

In consequence of violent deep seated ophthalmia, it some-
times happens, that purulent matter is formed within the pos-
terior or anterior chamber of the aqueous humour—constituting
the disease known under the name of hypopion.   Besides ex-
treme redness of the conjunctiva, a yellowish crescent-shaped
spot may also be observed at the bottom of the anterior chamber,
which gradually increases in size until the whole of the cavity
is filled.   During the height of the inflammation, the pain,
intolerance of light, &c., are intensely severe, and the matter
copious ; but as these symptoms decline, the pus is proportion-
ably absorbed, and sometimes disappears in a few days without
material injury to the eye.   In other instances, it remains for
weeks together, after the inflammation has entirely subsided, in
the anterior chamber, mixed with the aqueous humour, which
it renders turbid.   It is seldom, however, that the disease termi-
nates so favourably.   On the contrary, in bad cases of the kind,
ulceration and sloughing of the cornea are apt to ensue, followed
by discharge of the humours and destruction of the whole eye.
When the matter is lodged between the lamellæ of the cornea,
the disease takes the name of *onyx*, from its resemblance to the
white spot at the root of the nails.

TREATMENT OF HYPOPION.

The proper mode of managing this disease is not to puncture
the cornea and evacuate the matter, as some advise, but to
subdue the accompanying inflammation, after which it will be
found, commonly, that the matter is slowly absorbed, and will,
in time, entirely disappear.   When, however, the collection of
pus is so large and the inflammation so violent, as to leave no
hope of saving the eye, it may become expedient to open the

cornea and discharge the matter, in order to relieve the patient
from unnecessary pain and irritation.

Nevertheless, cases have been reported by Wardrop, Mon-
teith, and others, where, in the early stages of onyx and hypo-
pion, the aqueous humour has been evacuated, and the purulent
matter discharged, with speedy relief to the patient, and preser-
vation of the eye.   From statements made by Monteith, in par-
ticular, it also appears, that what, in many instances, seems to
be pus, is, in reality, lymph, as is proved by its consistence, and
other properties, and that its removal checks the disposition to
suppuration. Scarpa, long ago, maintained, that the fluid poured
out into the anterior chamber, in cases of hypopion, was, gene-
rally, lymph, secreted by the choroid coat.

SECTION XI.

HYDROPHTHALMIA.

Dropsy of the eye, a disease rarely met with, may originate either in the anterior or posterior chamber of the eye. It is, for the most part, dependent upon some constitutional affection, and is frequently connected with general dropsy. The most striking symptom of the disease is a gradual enlargement of the globe of the eye, without much pain or injury to vision. When the globe, however, begins to protrude from the socket, and the coats of the eye are rendered tense by the accumulation of serum within their cavities, a considerable degree of pain is experienced, which extends in some instances to the head. At the same time the vision becomes impaired, the aqueous humour acquires a turbid appearance, and the iris appears more deeply seated than usual, and trembles upon the slightest motion of the patient's head. Finally, if not evacuated by an operation, the humours accumulate in such quantity as to excite violent irritation and suppuration, and the eye is irrecoverably lost. Collections of serum between the sclerotic and choroid coats, and between the choroid and retina, are occasionally met with —the former termed sub-sclerotic, the latter sub-choroid dropsy. Conversion of the retina into a cord, and absorption of the vitreous humour, may be the result, from pressure, of sub-choroid dropsy, which is much more common than the sub-sclerotic.

TREATMENT OF HYDROPHTHALMIA.

When hydrophthalmia depends upon general dropsy, and is attended to in the commencement of the disease, some benefit may be derived, perhaps, from internal remedies—such as digitalis, squill, volatile tincture of guaiacum, calomel, cicuta, &c. But after vision has been materially injured, or destroyed, and the eye projects beyond the lids, the operation of paracen-

tesis is the only mode of treatment calculated to afford relief. This must be considered, however, as merely palliative. It may be performed with a common lancet or couching needle, and the operation occasionally repeated, or whenever the accumulation of water is such as to require its evacuation.

When the disease proceeds from local causes, such as blows upon the eye or superciliary ridge, and the fluid is confined to the anterior chamber, friction with mercurial ointment around the eyelids, and blisters to the temples will now and then stop the progress of the complaint, and effect a cure. To relieve the violent pain accompanying sub-choroid dropsy, puncture of the eye with a grooved needle at the place where couching is usually performed, should be resorted to. Ware and other oculists report interesting cases, where great benefit followed this mode of treatment.

SECTION XII.

OBLITERATED PUPIL.

From common ophthalmia or from iritic inflammation, whether induced by operations for cataract or by other causes, closure or obliteration of the pupil frequently takes place. The iris, under such circumstances, becomes wrinkled or puckered, and the pupil is either entirely effaced or contracted to a very small compass. If complicated with cataract, the opaque lens or its capsule may generally be seen behind the pupil of a whitish or bluish aspect; but if the lens and capsule remain transparent, the pupil, although contracted, still retains its natural black colour; and vision, perhaps, to a certain extent, is still preserved.

TREATMENT OF OBLITERATED PUPIL.

This disease can be relieved, or cured, only by an operation. Since the time of Chesselden, who was the first to resort to such an expedient, various methods have been practised. Chesselden's operation, in his own hands, proved eminently successful; with others it often failed, and was at last abandoned altogether. Recently, however, it has been revived by Sir William Adams, and as modified by him is better calculated, I conceive, for most cases of closed pupil than any other operation. "The patient being seated as in the operation for cataract, and the eye rendered steady by a gentle pressure with the concave speculum, placed under the upper eyelid, the artificial pupil knife should be introduced through the coats of the eye about a line behind the iris, with its cutting edge turned backwards instead of downwards. The point is next brought forwards through the iris somewhat more than a line from its temporal ciliary attachment, and cautiously carried through the anterior chamber until it has nearly reached the inner edge of that membrane, when it should

be almost withdrawn out of the eye, making a gentle pressure with the curved part of the cutting edge of the instrument against the iris in the line of its transverse diameter. If in the first attempt the division of the fibres of the iris is not sufficiently extensive, the point of the knife is to be again carried forward, and similarly withdrawn, until the incision is of proper length, when the radiated fibres will immediately contract, and an opening of a large size will be formed. After the operation is thus completed, the eye should be covered over with a plaster of simple ointment, spread on lint, and the patient put to bed with his head raised high,"* If the obliterated pupil should be combined with an opaque lens or capsule, the surgeon should make it a point at the time he divides the iris, to cut up or lacerate these textures, and thrust them forward through the pupil, which they will assist in keeping open.

Wenzel, Gibson, of Manchester, and many other oculists, prefer in cases of closed pupil, a section of the *cornea* and the removal of a portion of the iris with scissors. Under particular circumstances, I should select this operation in preference to that of Chesselden.

Several years ago, Dr. Physick invented a small instrument, resembling a saddler's punch, for cutting out a piece of the iris; but he never, as he informed me, used it. It will sometimes become necessary to make an artificial pupil—even although the natural one remain of its usual size—on account of corneal opacity.

Beer, Schmidt, Reissinger, Maunoir, Flagani, Assalini, Scarpa, have all particular modes of operating for obliterated pupil; they possess no advantages, it appears to me, over those in common use.

* Adams's Practical Observations, &c., p. 137.

SECTION XIII.

PROCIDENTIA IRIDIS.

A PROLAPSUS, or projection of the iris through an ulcer or wound of the cornea, is by no means unfrequent. The pain attending the disease is extremely severe, and the intolerance of light so excessive that the patient cannot bear the exposure of the eye for a moment. The pupil, in this disease, always assumes an unnatural shape ; its particular form, however, will depend very much upon the situation of the opening in the cornea. Generally, it is of an oval figure. Sometimes there are two or three projections of the iris, each of which passes through a distinct opening of the cornea. After the protrusion has continued for some time, an adhesion is apt to ensue between the cornea and iris, and the part of the iris that projects beyond the cornea becomes dry and hard, and sometimes sloughs away.

TREATMENT OF PROCIDENTIA IRIDIS.

When this disease follows a wound of the cornea, the iris may always be replaced at the time the edges of the wound are adjusted ; but when it proceeds from an ulcerated opening, the surgeon will find it impossible to retain the iris in its natural situation so long as the ulcer exists. The great object, therefore, in the treatment should be to heal the ulcer, and this will be most speedily accomplished by repeated touches of the argentum nitratum. The caustic will serve the additional purpose of subduing the morbid sensibility of the iris, and of removing the superfluous portion of it projecting beyond the cornea.

SECTION XIV.

CATARACT.

THE ancients entertained very erroneous notions respecting the nature and seat of cataract. They supposed it to be formed by an adventitious membrane in the posterior chamber of the aqueous humour. Dissection, and operations on the living subject, afterwards proved that the disease was confined to the crystalline lens or its capsule, which becoming opaque prevented the rays of light from passing to the retina.

Cataracts differ from each other as much in consistence as colour. Sometimes the lens is rendered perfectly fluid, and resembles milk, and on this account has been called the *milky* cataract. Sometimes it is found of the consistence of jelly or cheese, and hence the terms *gelatinous* and *caseous* cataracts. Not unfrequently the lens is perfectly *hard*, or ossified, so much so, that the sharpest instrument will make no impression upon it. When the anterior or posterior capsule is rendered opaque, and the lens remains transparent, or is absorbed, the disease is called *capsular* cataract. When a cataract exists at birth, the appellation *congenital* is applied to it. Most cataracts are of a bluish or pearl colour; some are gray or green; others white as snow. In a few rare instances the lens has been found of a brownish tint or perfectly black.

The formation of cataract has never been satisfactorily explained. By some the disease has been attributed to inflammation of the lens and its capsule, by others to hereditary transmission. That it may proceed from blows upon the eye and from wounds of that organ is very certain. In all cases of the kind there is reason to believe that the anterior capsule of the lens is either ruptured or cut, so that the lens itself is brought into immediate contact with the aqueous humour, which possesses the well known property of dissolving its texture as well as that of its capsule. It is remarkable, however, that an injury or destruc-

tion of one eye, as I have several times witnessed, will frequently give rise, at a subsequent period, to a cataract in the other. Old persons are most subject to cataract, though the disease may occur at any period of life; indeed, new-born infants are not exempt from it, and it has sometimes happened that all the children of a numerous family have been born with cataracts in both eyes. Persons whose eyes are much exposed to vivid and reflected lights are said to be peculiarly liable to cataract.

The existence of cataract may be determined, generally, by the following symptoms. In the commencement, the patient is often sensible of a diminution of sight long before any opacity can be observed behind the pupil. Objects, moreover, especially white ones, appear to him as if enveloped in mist or smoke, and when the eye is suddenly exposed to a strong light, vision is nearly destroyed. In a dull light, on the contrary, vision is more distinct because the pupil being expanded, the rays of light, besides their increased quantity, pass through the thin margin of the lens. When the lens is completely opaque, its colour will commonly indicate the nature of the disease. The black cataract, however, is very liable to be mistaken for amaurosis. Cataracts are said to have been formed very suddenly, or in the course of a night, without any obvious cause; but I am inclined to believe this to be erroneous, and that the disease has existed, at least in one eye, for some time, without the patient being aware of its presence, and that the discovery of it has been purely accidental.

TREATMENT OF CATARACT.

Although repeated attempts have been made, both by internal remedies and by local applications, to remove cataract, there is no well attested instance, I believe, on record, of a cure having been effected, except by an operation. There are two or three different operations now in use, each of which it will be proper to describe.

Couching or *depression* of the cataract, an operation practised, there is reason to believe, long before the time of Celsus, is usually performed by the modern surgeon either with a curved or straight needle. The former is preferred by Scarpa

—the latter by Hey. (See Plate VII. figs. 1 and 2.) The patient being seated on a low stool, with an assistant behind to support his shoulders and head, the operator, sitting or standing before him, passes the speculum of *Pellier* (Plate VII. fig. 3,) beneath the upper eyelid, and directs the assistant to hold it steadily, while with one or two of the fingers of his own hand he depresses the lower lid. He then takes the needle, (and if Scarpa's be used, which I prefer to any other,) holds it in his fingers like a pen, and laying the handle of the instrument nearly parallel with the patient's temple, directs its point backwards, and its convex surface forwards, and penetrates the coats of the eye, at its external angle, about two lines posterior to the iris. The needle is next pushed towards the superior margin of the crystalline lens, and thence in the direction of the pupil, until its point is distinctly seen. It only remains to lacerate freely, but cautiously, with the point of the needle, the anterior capsule of the lens; which being done, the lens itself should be pressed downwards and backwards by the needle, and lodged in the vitreous humour. Instead of withdrawing the needle immediately after from the eye, as is too often done, it should be suffered to remain a few seconds, lest the lens reascend, in which case the surgeon should again depress it, and then carefully remove his instrument and close the eyelids.

Extraction of the cataract is performed by a *knife* instead of a needle, and the opening made in the cornea in place of the sclerotic coat. There are two knives in general use—the one invented by Wenzel and improved by Ware, straight and blunt on the back, convex on the edge, five-eighths of an inch in width, and in other respects shaped like a wedge, or gradually tapering from the handle to the point—the other invented by Beer, and differing from that of Wenzel chiefly in having a *triangular* shape. (See Plate VII. figs. 5 and 6.) With either, the operation may be equally well performed.

The necessary arrangements being made, the patient is placed on a low chair or stool, and his head committed to an intelligent assistant, (one accustomed to the office and in the habit of performing the operation,) who with his fingers, instead of a speculum, elevates the superior eyelid, and supports it against the superciliary arch. The surgeon himself taking charge of the lower lid, which he depresses with one or more fingers, and waiting

Plate VII.
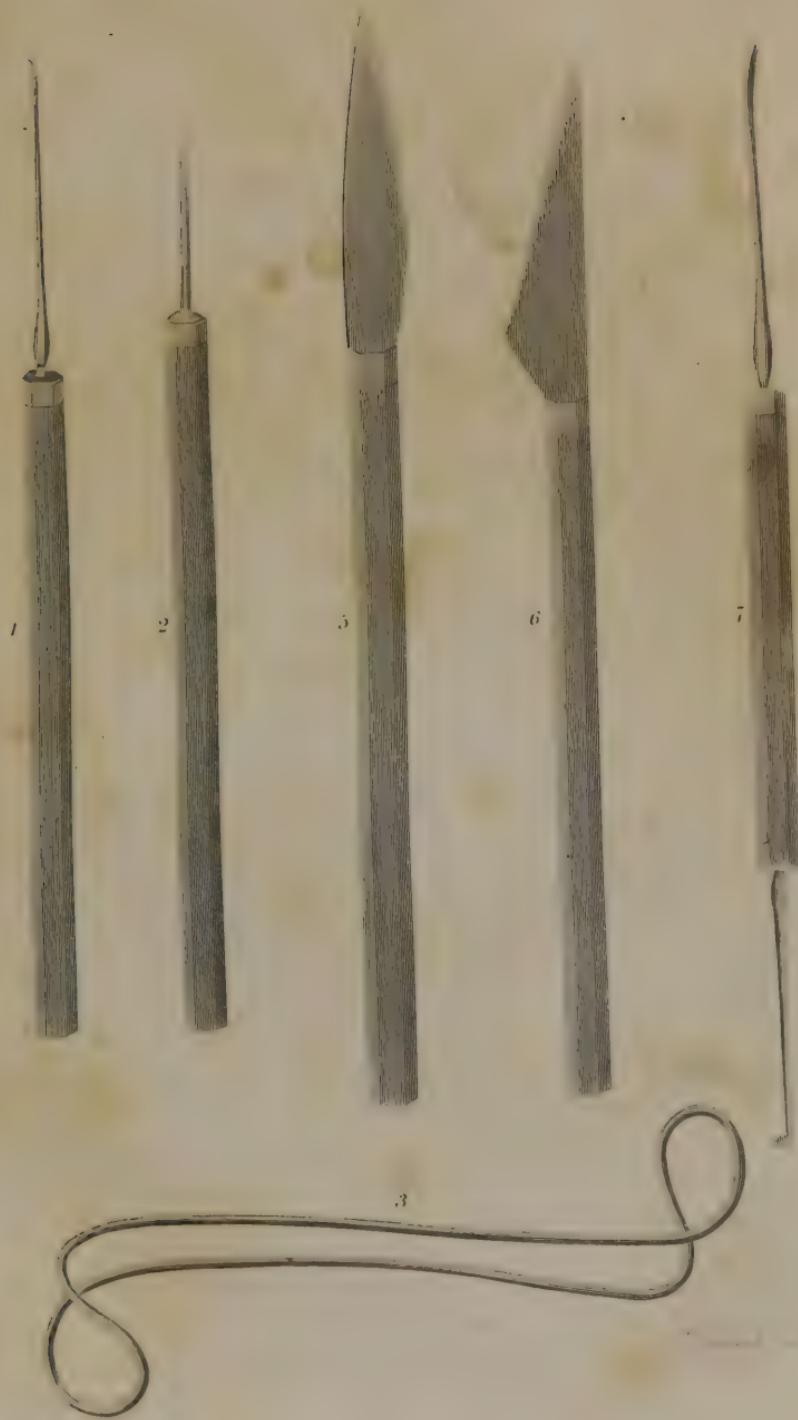
until the patient rolls the eye towards the inner canthus, and holds it steady, enters the knife above the equator of the cornea and about a quarter of a line anterior to its junction with the sclerotica, with the edge downwards, passes it slowly and steadily along through the anterior chamber until its point emerges at the inner edge of the cornea. This completes what has been called the *punctuation* of the cornea, and to finish the *section* it is still necessary to push on the blade of the instrument until it cuts itself out. As soon as this is accomplished, the aqueous humour is discharged, the knife is withdrawn, and the lids are closed for a few moments. The next step of the operation, and the most important one, is to separate the lids, gently raise the flap of the cornea with the curette, (Plate VIII. fig. 7,) pass a gold or silver wire through the pupil, and cautiously lacerate the anterior capsule of the lens precisely in its centre. If this part of the operation be well managed, and care taken to avoid any thing like pressure upon the globe of the eye, the lens, after its capsule is broken, will gradually approach the surface and be discharged through the opening made in the cornea, without bringing with it any portion of the vitreous humour. As soon as the lens is removed, the flap of the cornea should be adjusted, the lids closed, and a bandage applied lightly over both eyes. It sometimes happens, owing, principally, to the cornea knife being dull and ill-constructed, that the aqueous humour flows before the section of the cornea is completed, and that the iris falls under the edge of the knife, and is liable to be wounded. To guard against this, Baron Wenzel suggested an expedient which has proved extremely important—friction of the cornea with the end of the finger during the passage of the knife. If this plan be adopted, the iris will immediately retire from the edge of the knife, and so remain as long as the friction is continued.

The *absorbent practice*, as it is denominated by Sir William Adams, may be said, perhaps, to have originated with Mr. Pott; at least, that eminent surgeon was fully aware of the solvent power of the aqueous humour, and frequently took advantage of the circumstance, by pushing fragments of the lens which happened to be detached, during the operation of couching, into the anterior chamber. Gleize, also, as well as Scarpa, Hey, and others, followed the same practice. But it is chiefly owing to Saunders, Conradi, and Adams, that this mode

of removing the cataract has been brought to its present degree
of perfection.

There are two operations in use, each founded upon the
absorbent principle—the *anterior* and *posterior*. The first, or
the operation of Conradi, as it is usually called, is chiefly
adapted to the soft or fluid cataract, and may be performed in
the following way. The pupil being dilated by the application
of the extract of belladonna or stramonium to the eyebrow, an
hour or two before the operation, the patient is seated, and the
eye secured as in the operation of couching or extraction. With
a straight spear-pointed needle, an inch in length, rounded in
the shank, and tapering from the shoulder towards the point,
(Plate VIII. fig. 1,) the surgeon penetrates the cornea, at its
lower and outer part, about a line anterior to its union with the
sclerotic coat, carries the needle along the plane of the iris and
through the pupil as far as the centre of the crystalline lens,
the capsule of which is first lightly scratched over its whole
surface, then freely torn, after which the lens itself may be
broken up and some of its fragments brought by the needle
into the anterior chamber. It is highly important, in perform-
ing this operation, to guard against wounding the iris ; the sur-
geon, therefore, should not attempt to accomplish too much at a
single operation, but calculate, in most instances, upon a second
or third being necessary. In general, several weeks elapse
before the remains of the capsule and lens entirely disappear.

The *posterior* operation is distinguished from the anterior by
the circumstances of the opening being made in the sclerotic
coat instead of the cornea. Mr. Saunders was in the habit of
performing this as well as the anterior operation ; but for many
valuable improvements in the mode of executing it, and for the
invention of ingenious instruments adapted to the purpose, we
are particularly indebted to Sir William Adams. The needle
(Plate VIII. fig. 2,) chiefly employed by that surgeon for "solid
cataract in children and adults," is spear-pointed, eight-tenths
of an inch long, the thirtieth part of an inch wide, and slightly
convex throughout the blade. The eye being fixed by a *concave
speculum*, (Plate VIII. fig. 3,) the needle is passed through the
sclerotic coat about a line behind the iris, perpendicular to its
edges, until it reaches the anterior chamber and the nasal margin
of the pupil. Its edge is then turned backwards, and at a single

Plate VIII. V. 2.

4   2   1   6   5

3
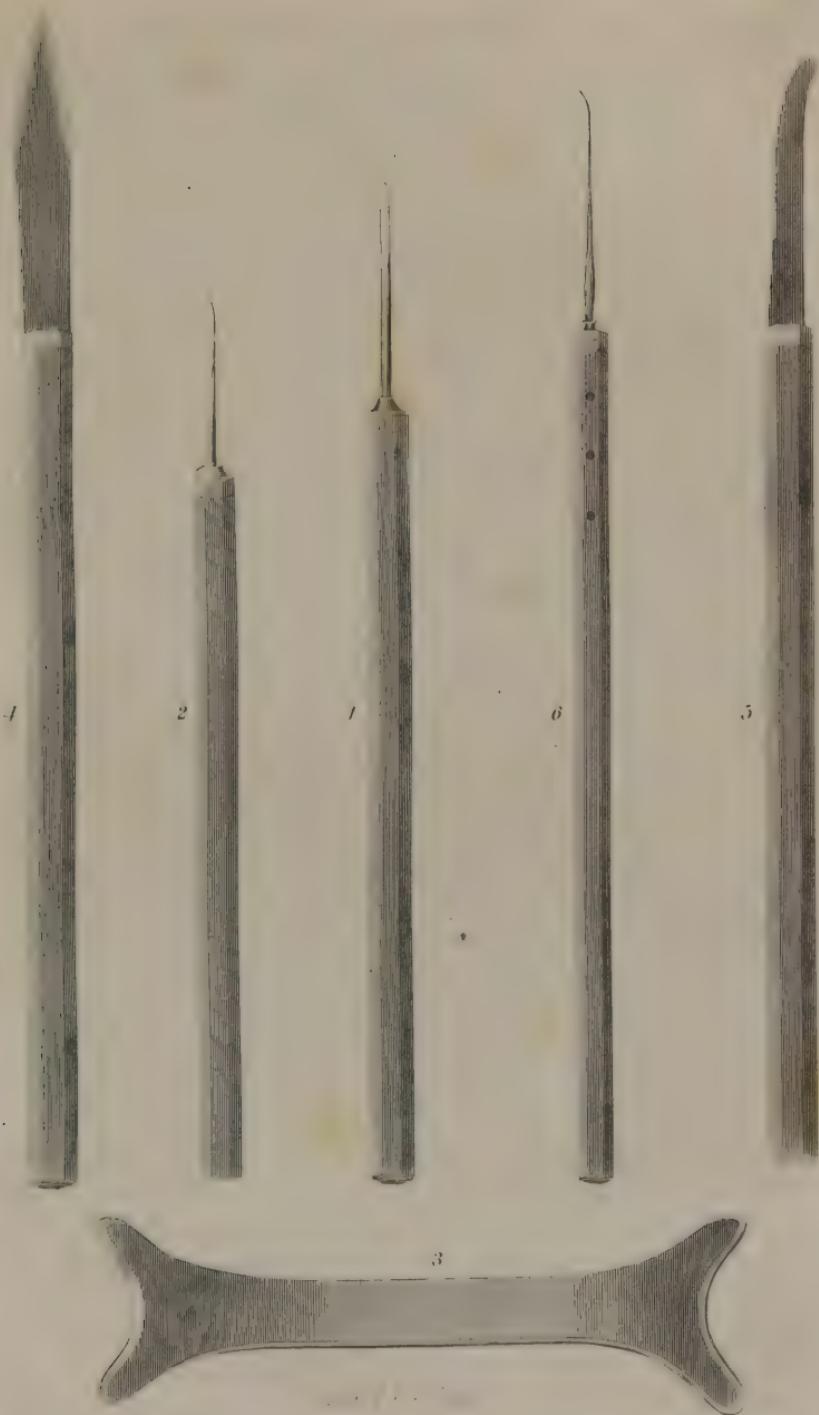
stroke made to divide the capsule and its lens. After this, repeated cuts are made in different directions, so as to divide the cataract into numerous pieces, most of which should be pushed afterwards by the flat surface of the needle into the anterior chamber, for solution.

Formerly, Sir William Adams, in cases of *very hard and solid* cataract, was in the habit of introducing a knife similar to that recommended by him for artificial pupil, but smaller, and of slicing off pieces of the lens: finding, however, the operation very difficult and sometimes impossible, and having known, in several instances, violent inflammation and even destruction of the eye to follow the lodgement of an entire lens, or of large portions of it in the anterior chamber, he has latterly performed the ordinary operation with his spear-pointed needle, with which he pushes the whole of the lens into the anterior chamber, and thence immediately afterwards extracts it through the cornea by making a section of that tunic with a knife of peculiar shape, (Plate VIII. fig. 4,) enlarging the incision should he find it necessary, with a blunt-pointed curved knife, (Plate VIII. fig. 5.)

Besides *couching, extraction*, and the *absorbent practice*, other operations have been proposed for the removal of cataract. For the most part, however, they are entitled to so little attention, as to render a description of them unnecessary. But a question naturally arises respecting the merits of the operations in common use, and how far one should be preferred to another; though there is little probability of such a question being ever satisfactorily determined; for, on both sides, it has been customary to extol the merits of one, and exaggerate the inconveniences of the other. Perhaps, it may be fairly stated, in relation to the operation of extraction, that under favourable circumstances— where the subject is young, healthy, the eye prominent, the vitreous humour sound, &c.—this operation, when dexterously performed, possesses advantages over every other, inasmuch as the cataract is at once removed, and a speedy cure follows. But, on the other hand, it must be recollected that the operation is always extremely difficult, and that, if it once fail, it cannot be repeated. As respects the operation of *couching*, it appears to me that the chief objection to it arises from the difficulty of keeping the lens below the axis of vision; in addition to this, from its

lodgement, in many instances, upon the retina, great pain and incurable amaurosis have not unfrequently ensued. Under most circumstances, therefore, I am inclined to prefer the " *absorbent practice*," principally, because the operations are easily executed, give little pain, and, if necessary, may be repeated again and again without injury to the eye, and are the most likely to prove successful. There are many patients, however, who never can be brought to submit twice to an operation, and others, who from not recovering their sight immediately, seek other aid; so that the surgeon may lose the credit he might otherwise gain if permitted to carry out his plans. When there is any probability of difficulty of this kind, I generally resort to couching or extraction.

It should be remembered that previous to the performance of any operation for cataract, the patient must be prepared by diet, purging, &c.; that the stramonium or belladonna be invariably used; that means be taken to subdue inflammation after the operation, and that the eye be not prematurely exposed to too strong a light. As a general rule, too, no operation should be undertaken so long as the patient enjoys the perfect sight of one eye.

SECTION XV.

CONGENITAL CATARACT.

THIS disease is more common than is generally imagined; indeed, many examples are recorded of all the children of a numerous family being born with cataracts in each eye.   In the District of Columbia, there is a family of six children, all of whom are blind from congenital cataract.   Sometimes only one eye is affected.

There is a peculiarity attending this disease which is seldom observed in common cataract—an extraordinary mobility or incessant rolling motion of the eye which increases with the age of the patient, and is seldom, if an operation be long delayed, entirely gotten rid of.   It is somewhat remarkable, also, that, unlike ordinary cataract, the lens of the congenital variety, in most instances, is gradually absorbed, and the two capsules approach each other, and are at last identified, forming a tough elastic membrane.   This fact was first particularly noticed by Saunders.

TREATMENT OF CONGENITAL CATARACT.

Formerly, surgeons entertained the opinion that congenital cataract did not admit of relief until the patient attained the age of eight or ten years. Gibson, of Manchester, and Saunders, of London, were among the first to correct this erroneous doctrine. Independently of the importance of an early operation, as respects education of the child, it is equally necessary to correct the mobility of the eye, and to guard against decay of the retina, which, for want of its natural exercise, is apt to fade and die.

For the removal of congenital cataract, I prefer, with the exception of the mode of securing the patient, the *anterior* operation as performed by Saunders, and described in the pre-

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ceding section. Instead of four or five assistants to hold the
child, some of whom must necessarily be in the way of the
operator, I am inclined to recommend, from experience, the plan
of Mr. Gibson, of Manchester, which is simply to enclose the
body, arms, and legs of the patient in a bag open at each end,
and furnished with tapes or strings to secure the limbs. Thus
situated, the child may be laid on a large pillow placed on a
table, and firmly held by one or two assistants. The operation
may be performed, if necessary, on infants a month or six weeks
old.

Before concluding the subject of cataract, it may be proper
to state that the anterior capsule of the lens sometimes adheres
to the iris, and occasions an immobility of the pupil. Under
these circumstances, I should still prefer the *posterior* operation,
and the use of the curve-pointed needle of Sir William Adams,
(Plate VIII. fig. 6,) taking especial care to be as gentle as possible
in separating the adhesion, lest the iris be so injured as after-
wards to cause obliterated pupil. It now and then happens, that
after operations for cataract,—and operations, too, that have
succeeded for a time,—secondary cataract is produced. This
arises from capsular opacity. The posterior operation will, for
this variety of the disease, also be found the most suitable.

SECTION XVI.

AMAUROSIS.

AMAUROSIS, gutta serena, or an insensible state of the retina, a disease of frequent occurrence, and always extremely difficult to cure, may be distinguished, generally, from other affections of the eye by the following symptoms. The pupil is of a green-ish black colour, greatly expanded beyond its natural size, irregular in shape, and its edges undulating. When exposed to the strongest light, no perceptible contraction can be observed. Sometimes, however, instead of being dilated, it is unnaturally contracted. In other instances the iris retains its sensibility so far as to be obedient to the stimulus of light, and contracts and dilates as usual, and yet the retina is completely insensible. In addition to these symptoms, the general aspect of the eye is peculiar, its natural lustre and intelligence are diminished or lost, and in bad cases of the disease, the patient is unable to direct his eyes steadily at any object, but turns them towards it obliquely. Most patients, in the incipiency of the disease, are exceedingly annoyed by fantastic figures, called by most writers muscæ volitantes, which are constantly flitting before their eyes, especially when white and shining objects are looked at. Severe pain about the superciliary ridge and orbit is a frequent concomitant of the disease.

The *causes* of amaurosis are either local or constitutional. Among the former may be enumerated blows upon the head, wounds of the supra-orbitary nerve, exposure of the eye to vivid lights, long-continued fatigue of the eye from examination of minute objects, the use of powerful magnifying glasses, confinement in dark cells or dungeons, pressure upon the optic nerve from tumours, hydrocephalus, &c. The constitutional causes are derangement of the digestive organs, violent mental emotions, suppression of accustomed or periodical discharges, immoderate venery, manstupration, excessive indulgence in

opium and other narcotics, frequent attacks of syphilis, repeated mercurial courses, and a great variety of similar sources of excitement.

There is a singular variety of amaurosis, called nyctalopia, or night blindness, in which patients see objects with perfect distinctness during the day, but lose their sight as soon as it becomes dark, remain blind throughout the night, and upon the approach of morning again recover their vision, which continues perfect until the return of evening. This disease sometimes arises without any evident cause; generally, however, it is endemic, and prevails to a greater extent in the East and West Indies than in other countries. Sometimes it appears to be hereditary; at least there are instances of whole families for several generations being subject to it. In Maryland there are now two distinct families in which the disease has existed from time immemorial. Persons having black eyes are said to be more subject to the complaint than others. When examined, the eyes do not commonly exhibit any visible defect, except that the pupil is unusually large, and less moveable than natural.

TREATMENT OF AMAUROSIS.

This must depend in a great measure upon the cause of the disease. When it arises from any organic defect, and from most of the local causes above enumerated, there will be very little probability of affording permanent relief. If it proceed from gastric derangement, or from passions of the mind, emetics and purgatives will prove the most useful remedies, and after full benefit has been derived from these, tonics may be resorted to.

For *nyctalopia*, repeated purgatives and a succession of blisters to the temples, are highly recommended by Mr. Bampfield,* the most experienced writer on this subject.

* Medico-Chirurg. Transactions, vol. v

SECTION XVII.

HORDEOLUM.

THE hordeolum, or stye, is a red, inflamed, and painful tumour involving one or more of the Meibomian glands. It is similar, in many respects, to the common furuncle or boil, met with in other parts of the body, and is usually seated upon the lower eyelid near its inner angle. The disease is very common, and arises, for the most part, from some disordered action of the stomach. Like the furuncle, it seldom terminates in suppuration.

TREATMENT OF HORDEOLUM.

Purgative medicines and attention to diet will often, without the aid of local applications, remove hordeolum. When the tumour, however, continues stationary for some time, and is painful, an attempt should be made, by warm emollient applications, to excite suppuration in the cellular membrane surrounding it. By these means we sometimes succeed in detaching the core or slough that occupies the centre of the tumour, after which the opening left will soon heal. When the inflammation has subsided, and the tumour becomes indolent, the application of lunar caustic or of nitric acid will frequently effect a cure.

SECTION XVIII.

ENCYSTED TUMOURS OF THE EYELIDS.

Steatomatous and melicerous tumours, from the size of a pea to that of a large bean, are frequently met with beneath the conjunctiva, or imbedded in the substance of the eyelid. They are, generally, soft, devoid of pain, and roll under the finger. The upper eyelid is the most common seat of the disease. When the tumour attains a very large size, it is liable to interfere with vision, or it may produce eversion and other diseases of the eyelids.

TREATMENT OF ENCYSTED TUMOURS OF THE EYELIDS.

Extirpation is the only remedy, and this, when the tumour has acquired a moderate size, is easily accomplished, especially when it is seated on the inside of the lid immediately beneath the conjunctiva. The surgeon everts the lid with his finger, secures the tumour by a fine hook, then makes an incision with a diminutive scalpel over its surface parallel with the eyelid. As soon as the external covering is fairly divided, the tumour is easily loosened from its bed, and by a few strokes of the knife or scissors entirely removed. When it is deeply seated within the substance of the orbicular muscle, or lies exterior to it, the operator will find it most convenient to extract the tumour by cutting through the lid on its outer side—taking care to separate the muscular fibres longitudinally.

SECTION XIX.

ENTROPEON.

By the term entropeon is understood an inversion of the tarsus, or its cilia. *Trichiasis* is also used, though improperly, to denote the same disease. The upper eyelid is commonly the seat of entropeon, which, in proportion to its duration and the extent of the inversion, is productive of more or less irritation by encroaching upon the ball of the eye. In general, the entropeon proceeds from protracted ophthalmia, or psorophthalmia, and from other causes capable of producing a morbid inclination of the tarsus, or a wrong direction of the cilia.

TREATMENT OF ENTROPEON.

An evulsion of the eyelashes by a pair of fine forceps or tweezers, when the entropeon depends upon their unnatural position, is the only remedy calculated to remove the complaint, and this does not succeed always. For inversion of the tarsus itself, several different operations have been practised. In simple cases, especially where the disease appears to be owing to inordinate relaxation of the skin of the eyelid, the removal of an oval portion of this superfluous skin by the forceps and curved scissors will generally effect a cure, provided the surgeon take care to cut as closely as possible to the tarsus, and afterwards draw the edges of the wound together by a fine suture. The cicatrix that ensues will afterwards prevent the tarsus from falling inwards upon the globe of the eye. But this operation does not commonly answer for cases of long standing, unless a cicatrix be made by caustic or a red-hot wire, an operation I have several times performed successfully. Sir Philip Crampton, the celebrated Irish surgeon, has proposed to dissect off the thickened conjunctiva, which he conceives to be the most common cause of entropeon. On the other hand, Mr.

Saunders and Dr. Dorsey advise the entire or partial removal of the tarsus. I have, however, tried these different operations, and have found them painful and difficult, and not always successful. I am inclined to think more favourably of an operation lately proposed by Dr. Jæger, of Vienna, though I have had no opportunity of fully testing its merits. The surgeon, instead of removing the whole tarsus, merely dissects off its anterior edge, and along with it the cilia, thereby removing a considerable source of irritation, at the same time preserving that portion of the cartilage which serves to guide the tears towards the puncta lacrymalia. There are several other operations for entropeon, according to the different causes producing it, which, for want of space, I cannot give an account of.

SECTION XX.

ECTROPEON.

THE ectropeon is the reverse of the entropeon,—the eyelid being turned outwards instead of inwards. Sometimes both the upper and lower eyelids are simultaneously affected, but in most instances the lower lid is the seat of the disease. Like the entropeon, it may proceed from repeated and long-continued attacks of ophthalmia, and in such cases the conjunctiva lining the lid is generally thickened or in a fungous state. Occasionally, the ectropeon arises from burns or wounds in the neighbourhood of the eyelids, the cicatrices of which, by contracting and distorting the tarsus, evert the lid and expose its inner surface. In all cases of the kind, the deformity arising from the red and exposed surface of the conjunctiva is considerable, and the irritation to the globe of the eye such as not unfrequently to produce opacity or ulceration of the cornea.

TREATMENT OF ECTROPEON.

Excision of the fungous conjunctiva, and the application of various caustics, have been advised by most writers. The only operation, however, likely to afford permanent relief is that practised by Sir William Adams. It is performed in the following way. A portion of the lid, in the shape of the letter V, is removed from the outer angle of the eye by a pair of straight sharp scissors. The thickened conjunctiva is next carefully dissected off, when there will be no obstacle left in most cases to the replacement of the lid. To retain it in its situation and to promote adhesion, a fine interrupted suture should be passed through the edges of the wound, and supported by a compress. The size of the portion to be removed must depend upon the extent of the eversion. It needs hardly be mentioned that

the base of the triangular incision should look towards the edge
of the tarsus. When the ectropeon depends upon a cicatrix,
from loss of substance near the lid, or from a burn, it may
become necessary to make incisions parallel with the lid through
the contracted integuments, and afterwards interpose lint to
prevent their reunion. But the operation seldom succeeds per-
fectly—owing, perhaps, to ignorance, want of attention, mis-
calculation as to the quantity of substance to be removed, or to
the incisions being made in the wrong direction, and other
causes. In some cases the removal of the *cicatrices* themselves
will effect a cure.

Three years ago, assisted by Dr. Clark, of New York, and
my son, Dr. Charles Bell Gibson, of Baltimore, I performed a
blepharoplastic operation on Mr. Freeman Scott, of Penn
Township. In consequence of a severe burn in the face, some
months before, great deformity arose in each eyelid, from the
contraction of the cicatrices following that injury. The left
lower eyelid in particular, was drawn down upon the cheek
more than an inch, and became so everted, red and painful, as
to annoy the patient exceedingly, and to distort his features in
the most horrible manner. After dissecting up the lid as much
as possible from the cheek, to which it had formed attachments,
I cut out of its centre a piece in shape of the letter V, and
bringing the edges together with very short and fine hare-lip
pins, made for the occasion, succeeded in a few days in uniting
the parts, and restoring the form of the lid so completely as to
render it difficult for any one to observe that an operation had
ever been performed on the part, or that any such deformity as
I have described had ever existed. Operations founded upon
the same principle, but differing somewhat in the mode of
execution, have recently been successfully performed by Dr. J.
Mason Warren, an accomplished young surgeon of Boston,
who has already, perhaps, effected more in the restoration of
mutilated parts than any other American practitioner.*

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* See Warren on Restoration of the Lower Eyelid, in vol. xxiv. of Boston Med.
and Surg. Journ. No. x. ; Warren on Rhinoplastic Operations in same Journal,
&c. &c.

SECTION XXI.

FISTULA LACRYMALIS.

EPIPHORA or stillicidium lacrymarum, and fistula lacrymalis, have been used by some writers indiscriminately to denote the same disease; by others they have been looked upon as essentially distinct; they may, however, I conceive, be ranked with propriety as varieties or stages of the same complaint; but it by no means follows that every epiphora must necessarily terminate in fistula lacrymalis, although fistula lacrymalis may be said to be preceded invariably by epiphora.

Epiphora may arise from several different causes—from an undue secretion of tears—from closure of the puncta lacrymalia or obliteration of the canaliculi lacrymales—from inflammation of the lacrymal sac, and from stricture of the nasal duct. These in their turn may be the result of other agents, especially of the different varieties of ophthalmia.

When the puncta lacrymalia are closed, the tears constantly flow over the lids, and spreading upon the cornea, produce a morbid refraction of light, which obliges the patient constantly to wipe them away. On the contrary, when the nasal duct is obstructed, the tears accumulate in the sac, and form a tumour immediately below the tendon of the orbicular muscle; and upon pressing this tumour, the tears regurgitate through the puncta mixed with flocculent matter. So long as the disease continues in this state, the terms epiphora, and stillicidium lacrymarum, are strictly applicable to it. Should the sac, however, inflame and ulcerate, and an opening be established between it and the integuments, then a fistula lacrymalis is produced. In such cases the inflammation generally extends to the globe of the eye, and in some instances to the side of the face and head. If neglected, the disease may continue for months or years, or indeed during the patient's life, sometimes better, sometimes worse, and in the end may be followed by caries of the unguis, and injury of the ethmoid and spongy bones.

TREATMENT OF FISTULA LACRYMALIS.

A simple epiphora, dependent upon obstruction of the nasal duct, or, as sometimes happens, upon a morbid secretion from the Meibomian glands, may be generally removed by the repeated introduction of Anel's probes into the puncta and duct, and by the application of the unguentum hydrargyri nitrati, and other astringent ointments, and washes to the lids and edges of the tarsus. After the obstruction has been overcome by the probes, the passages should be syringed out two or three times a day, taking care to introduce the curved pipe of the syringe into the lower punctum, and at the same time, with the point of a finger to stop the upper punctum, and thereby to prevent the regurgitation of the fluid. Tepid water, at first, and afterwards a weak solution of the sulphate of zinc or acetate of lead, will be found the most suitable wash. When the epiphora depends upon obliteration of the puncta or canaliculi lacrymales, the disease may be considered incurable.

Fistula lacrymalis can be removed only by overcoming the obstruction in the nasal duct, or by establishing a new route for the tears through a perforation of the unguis. The first mode should, if practicable, be always resorted to. The surgeon introducing into the fistulous orifice a common pocket-case probe, carries it, at first, horizontally, until it is fairly introduced into the cavity of the lacrymal sac; the handle of the instrument is then raised, and made to rest nearly in a perpendicular direction against the superciliary ridge, while the point is directed downwards in the course of the duct, and pressed firmly but steadily against the stricture. As soon as this is overcome, the probe passes easily into the nose, and a few drops of blood and matter issue from the nostril of the affected side. The probe is then withdrawn, and a silver style (an instrument resembling in shape and size the probe, but only an inch and a quarter in length, and having a head obliquely placed upon its top) introduced in its place. This is permitted to remain in the passage, and serves the purpose of conducting the tears by a sort of capillary attraction into the nostril. In the meantime, the fistulous orifice gradually contracts around the neck of the instrument, the head of which afterwards prevents it from falling into the nose. Occa-

sionally the style should be withdrawn, and the passage syringed out. Some patients find it necessary to wear the style several months, others are cured by it in a few weeks. Where the fistulous orifice is so small that the probe will not enter, it should be enlarged by a spear-pointed lancet. Sometimes it is necessary to make an opening into the sac, where the fistula is not properly situated, or does not exist. Under these circumstances, the surgeon should always take as his guide, the small tendon of the orbicularis, and immediately beneath this make his incision. Some surgeons, among the rest Dupuytren, leave the style or a cannula, permanently, in the duct, and heal the fistulous opening. I have tried the plan, but found so many inconveniences from it, as not to have practised it for several years. In several instances the cannula has worked out by causing ulceration of the sac, or by passing into the nose, after having caused abscesses, ulceration, and caries of the bones. My friend, Professor Mussey, of Cincinnati, in cases of fistula lacrymalis, employs the gold tube, but leaves a style in the tube until all irritation and purulent secretion have ceased, and then withdraws it.

If, as sometimes happens, the nasal duct be permanently closed by stricture, or by an exostosis from the surrounding bony canal, it will become necessary to perforate the os unguis. This can be most conveniently done by the perforator of Cruikshank,—an instrument resembling, in some respects, the shoemaker's punch —which is carried through both sides of the lacrymal sac, and made to bear upon the inferior part of the unguis. To prevent the instrument from passing too far inwards, a narrow piece of horn should be carried up the nostril, and upon this, the perforator will rest and perform its office with great facility. After the opening has been made through the sac and bone, a silver or leaden style, somewhat shorter than that used for the natural duct, should be introduced and worn as long as may be found necessary. When the operation is properly performed, the opening will always be made between the superior and inferior spongy bones.

There are other operations practised for the cure of fistula lacrymalis, but they seldom prove so effectual as those I have described.

SECTION XXII.

STRABISMUS.

Among a small parcel of manuscript and other papers I received two or three months ago from my old master and friend, Sir Charles Bell,—requesting me to make what use of them I thought fit, as some of them might not possibly be published by himself,—I found an interesting essay on the philosophy of strabismus. As the subject is one, which, from its importance, is now exciting very great interest both in and out of the profession, I insert the essay entire, in this place, in hopes that it will furnish a greater amount of information to my pupils, than they can get, at this time, from any other source.

" ON SQUINTING—ITS CAUSES—THE ACTUAL CONDITION OF THE EYE —AND THE ATTEMPTS TO REMEDY THE DEFECTS.

" It is pleasant to turn from the contemplation of the effects of violence, and the more severe operations of surgery, to a delicate operation which remedies a defect, (which at least gives great uneasiness) and is really a triumph of art. But, while it is agreeable to witness the rapidity with which information is received and acted upon, and the eagerness of surgeons to put in practice a new operation, it is to be regretted that the physiological principles relating to the cure of this deformity have not been more attentively studied.

" Vision is a subject of high interest in a physiological point of view. It has been studied by our philosophers in every age, and now a correct knowledge of the functions of the eye becomes more especially of practical importance, by enabling us to judge of the propriety of operations for the cure of squinting.

" I have to confess that when, formerly, I endeavoured to show the strict relation which exists between the action of the

muscles of the eye and the impressions on the retina, I met with criticism from one, whose authority carries great weight in these inquiries. But my respect for that gentleman does not overcome the conviction that, on this question, and on all that regards the exercise of the eye, we must hold in view two distinct properties of the organ,—the reception of light on the retina, and the consentaneous action of the muscles of the ball of the eye. This relation becomes a matter of the first consequence in endeavouring to comprehend the subject of squinting, and to enable us to judge of the propriety of the operation for remedying the defect.

" There are in the the retina two spots distinct in their properties from the general surface. Though not antipodes in place, these spots are opposed to each other in respect to sensibility, one being exquisitely sensible to the impression of light, and the other absolutely insensible. The sensible point is in the axis of the eye, and is the foramen of Sœmmering ; the insensible spot corresponds to the insertion of the optic nerve.* When the rays from an object impinge on the sensible part, animation and effort are immediately given to the guiding muscles of the eye. When the rays fall on a part of the retina removed from this centre of sensibility, and more so when they strike on the absolutely insensible spot, the stimulus to a correct action of the muscles is lost. We shall presently find that the defect of the weak eye of one who squints, is mainly in the tonicity of one muscle, and that it is at this time of comparative inaction that the other muscles prevail against it.

" Take the plan, Fig. 1, as representing the right eye, and the small circle A as the sensible spot ; the rays from the object falling upon A are seen, and animate the organ. Suppose Fig. 2 to represent the left eye distorted to the degree that the rays fall on B, that being the insensible spot, the object is not perceived with that eye.

" The farther from the sensible spot in the axis of the eye the rays from the object fall, the less distinct is the image. Thus, in the common experiment by which an object is seen double, that is, of looking on another object beyond it, so that the rays are made to fall on the inside of the central and sensible spot of

* " See Mariotti, and the Experiments of De la Fond, Cours Experimental, t. iii. § mdccxcvii.; Haller, Picturæ Locus, lib. xvi. t. v.

the retina, these double impressions are weak, compared with
the single image. Accordingly, it is not required that the rays
should fall on B alone, to be neglected. If the point on which
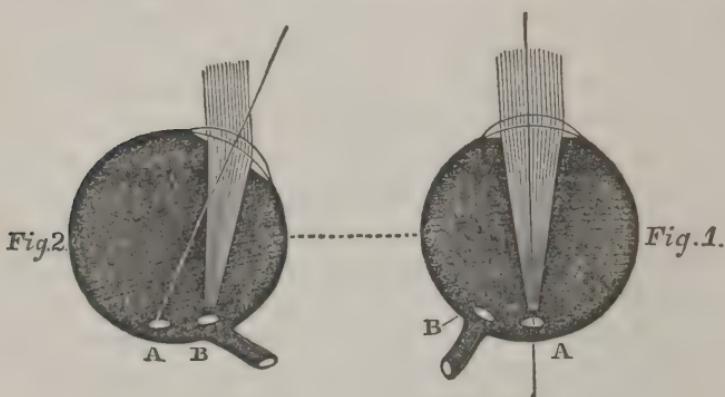
they do fall be considerably removed from the spot A, the mus-
cles of the eye will be without their sufficient stimulus to correct
vision ; and, being left uncontrolled, the weak muscles will yield
to the prevailing tonicity of the others.

" We ought not to leave this subject without noticing the
advantage derived from the central spot of the retina being
more sensible than the general field. Were the whole surface of
the retina equally susceptible of the impressions of light, we
should be dazzled, and see nothing ; the direct light, whether of
the sun or of a lamp, would overcome, by its intensity, the re-
flected light from the object to which the eyes were directed.
That rapid search which the eye makes in surveying a scene,—
the desire to have the object which is faintly seen on the general
field of the retina presented to the sensible centre, as well as the
happy consequences of that perfect vision which results from
the sensation on the retina, being combined with the voluntary
direction of the eye, would be lost.

" Leaving this department, let us give more attention to the
muscles of the eye. And I shall be excused in stating here
what I have already taught on this subject.* The eyeball is
suspended in a cellular and adipose membrane so loosely, that
it is like a thing floating in water, ready to move on the slightest

* " Nervous System.

impulse. It is surrounded with muscles; the four recti embracing it, and terminating forwards; the two obliqui embracing it, and terminating backwards; while it is covered anteriorly by the orbicularis of the eyelids. We contemplate these muscles in two conditions,—a passive and tonic state, during which the eyeball is poised between them; and the more animated and active state, when the axes of both eyes are directed to an object. When the muscles are left in their passive state, their unexcited condition, the eyelid is dropped, and the pupil a little turned up; this is the state in sleep.

"But of these muscles a certain class is voluntary. At the moment of awakening, the atollens palpebræ lifts the eyelid, and the recti muscles direct the axis of the eyeball to an object, or search for it; and that search is to place the centre of the retina in such a relation to the object as that the reflected rays from it shall fall on the sensible spot, and then the object becomes distinctly visible. Vision thus obtained is the conjoint operation of the voluntary muscles of the eye and of the impression on the retina; and this double operation is necessary to perfect vision. It is that state of speculation which implies scrutiny; the motion, and sense of the eye being combined; and the correspondence in motion and in sensation of both eyes being perfect.

"When a child has never seen, as in the case of congenital cataract, when there may be sensibility to light, without an image *seen*, 'the eyes roll in different directions, and without correspondence.'*

"But certain of the muscles of the eye have another all-important office, without the performance of which we should not long enjoy sight,—the protection of the organ. For this the exquisite and peculiar sensibility of the surfaces of the eye, and of the roots of the cilia, is bestowed; and under this sensibility the action of the muscles is arranged. For example, in couching, the surgeon entreats the patient to command himself, and to look straight forwards, which he does; but the instant that the eyeball is touched with the point, it is *involuntarily* turned inwards and upwards. What is the object of this in nature, and how accomplished? Is not this the position of the eye of

* "See the cases, No. cvi. of Nervous System.

one who has a decided squint? May not the investigation of
the one condition tend to the understanding of the other?

"How directly the cornea is turned towards the inner canthus,
may be determined by a simple and harmless experiment. If,
on closing the eye, and placing the point of the finger on the
eyelid so as to feel the convexity of the cornea through the
eyelid, we make an effort more firmly, and, as it were, spasmo-
dically, to shut the eyelids, as if something were entering the
eye,—it will be found that the cornea slips from under the
finger, towards the inner canthus. On ceasing to exert the
eyelids, the cornea returns again under the point of the finger
to the centre.

" The apparatus for throwing out what is offensive to the eye
is not so perfect in man as in quadrupeds; but the mechanism is
in some degree the same. The caruncle with its glands, and the
membrana semilunaris, are less perfect than the haw, and the
muscles of the human eye are deficient in the retractor muscle;
but the action of those which we possess is the same, when there
is irritation of the surfaces. The eye is dragged towards the
os planum, the cornea is turned to the caruncle, and the fold of
the conjunctiva, called semilunaris, is thereby thrust forwards.
By this means the dust which is floated towards the inner angle
of the eyelids, is extruded.

" It is obvious that this motion implies the combined action of
all the muscles of the eye and eyelids, with the exception of
one, most material to our subject,—that is, the external rectus.
Without the relaxation of this muscle, the cornea could not be
turned into the inner canthus; and without the alternate motion
of the cornea to and fro, by the successive contraction and
relaxation of the external rectus, the eye could not by any action
free itself of the offending body. We come to the conclusion,
then, that the external rectus has something to distinguish it
from the other muscles; and so far we are on our way to
comprehend its peculiar defects. We perceive that, in an
obstinate squint, the eyeball is exactly in the position into
which it is thrown in the sudden action of guarding the eye!

"We may observe here, that the operation of cutting across
the rectus internus muscle for the cure of a squint, was not un-
dertaken on a deep consideration of the condition of the rectus
externus; but it was to cut across what appears to the patient's

feelings to tie the eyeball, and confine it towards the nose. Some-times the patient, when you examine the eye, and desire him to turn the eye outwards, says he cannot do so beyond a certain degree; and he will add, that it seems tied. But this is not a common attendant on squint.

" Neither is there a doubt but that the internal rectus, by its continued action, acquires strength ; while its antagonist, the external rectus, by the reversed condition of relaxation, becomes weak. The opposite effects which have followed the operation of cutting the muscles, and the disappointments, after much experience, call for a more philosophical investigation of the subject.

" Every person understands, that to act, requires a stimulus to the contracting muscles. But it is only a physiologist who can comprehend that in every such action, there must also be relaxation of the opposite set of muscles. And I have elsewhere* said, that this is not a relaxation like the throwing loose of a rope. The relaxation of a muscle is as fine, or rather a more delicate administration of power than the contraction. It is the derangement of this relaxing influence which produces squinting.

" Many of the actions or motions which, in a morbid con-dition, or resulting from accident, appear irregular, and cannot be accounted for, may be explained by a careful study of the natural functions. Thus, in No. ciii. of the cases in the Appen-dix to my volume on the Nervous System, we find this passage, —' There lies in the hospital a patient with a fracture of the base of the skull, in whom there is a regular motion of the eye-ball, as regular as the motion of a pendulum, from right to left.' In case cv., the same motion is noticed,—' It is not so much upwards and downwards, as in a transverse direction.' This is a derangement in the condition of the rectus externus, imita-tive of its natural function.

" I must now advert to some of my experiments† on these muscles : a more objectionable mode of inquiry, perhaps, from its cruelty ; yet I thought I was making it unnecessary for others to have recourse to the same. Experiments must be made on the monkey ; the only animal that has the same muscles as man.

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* " The HAND, a Bridgewater Treatise.　　　† " See Nervous System.

The possession of the powerful *retractor oculi* will render all experiments on quadrupeds unsatisfactory.

" I divided the rectus superior; the animal lost the power of raising the eye, when he raised the eyelids, and turned up the other eye. The eyelid was held open, and the eye touched with a feather; the cornea was instantly turned up, and in a greater degree than in voluntary action.

" This was surely sufficient proof to show that the recti and obliqui were distinct in office,—that there were two distinct muscles employed in raising the eye; the one, the rectus superior, directing the eye in vision, and voluntary; and the other, the inferior oblique, acting involuntarily, for the protection of the eye, and for wiping the cornea, and dipping it in the fountain of the tears. Those who could not assent to the argument, that the oblique muscles perform their motions more rapidly than the straight, and, therefore, that these different classes could not correspond in any combined actions; or who could not see that, if there was a necessity for oblique muscles to direct the eyeball, there should have been four muscles and not two, might still have given their belief to so decided a proof of difference between them as this experiment afforded.

" I cut the superior oblique muscle of the monkey. He was very little disturbed by the experiment, and turned his eyes in all directions, with his characteristic inquiring looks. On holding open the eyelid, and waving the hand before him, as threatening the eye, the eye turned up further than the other eye; and there was a hesitation and apparent difficulty in bringing it down again.

" The division of the inferior oblique muscle did not in any sensible degree impede the voluntary motions of the eye.

" If any one will give a moment's consideration to the subject, he will see that the eyeball must be rolled upwards by different muscles. When we look upwards, the eyelid, as well as the cornea, is elevated; and there must be a perfect accordance in the action of the superior rectus and of the attolens palpebræ, or the pupil will be hid under the eyelid. But as the cornea is raised in the other action, for preserving the eye, while the eyelid is depressed, it must be effected by another muscle, namely, the inferior oblique, which consents in action with the orbicu-

laris oculi. The one muscle accords with the elevation of the eyelid, the other with its depression.*

" It would appear that our operators sometimes think physiology a matter foreign to their pursuits. Yet, in this subject, we cannot comprehend the most common occurrence without a knowledge of function. There is a squint, for example, that puzzles not a little, and obscures the reasoning in common cases of true *strabismus.* The cornea is directed upwards, attended with adhesion to the eyelid. This is one of the effects of the action of the inferior oblique, in turning up the eye during irritation. In inflammation, the irritation being excessive, the cornea is turned up, and often it is permanently fixed by adhesion in that position. In such distortion of the eye, the interior has probably suffered ; often the eyeball is small and sunk.†

" Out of these experiments, there arises a question :—When one of the recti muscles is divided, the pupil is directly and permanently drawn in the contrary direction ; why does not the same follow the division of the internal rectus, in those that squint ? We know nothing until this be explained.

DOUBLE VISION—THE STATE OF THE EYE IN INTOXICATION.

" In soporific affections, the brain influences the muscles unequally. In intoxication, we have demonstration of what

* " If the intelligent reader will peruse the cases of involuntary motions of the eyes, consistently with perfect and steady vision, he will have additional reason to conclude that vision is a double operation, combined, of the impression on the retina, with the sensible operation of the muscles of volition. See Nervous System, p. 374. ¶ *Nystagmus bulbi.*

† " We ought to have a term for this permanent distortion, and *Luscitas* is by some applied. But authors use it in different senses. ' *Strabismus* est, quando uterque oculos ad exteriora conversus est, *Luscities* quando introrsum ad nares.' —*Boerhaave.* The conclusion of the paragraph I like better, ' Omnes hi morbi nunquam intelliguntur nisi cognitis conditionibus, quæ ad visum requiruntur.' The unequal action of the muscles moving the eye is *Strabismus.* The unstable and frequent motion of the eye, *Hippos*, by Galen. See Histoire de Chirurgie, De Gorter, &c.

" The eye may be tied by adhesion, so as to be drawn from the true parallel, and so produce double vision. The adhesion may be stretched, or the eyelid may be so relaxed, as to admit the ball to resume its place. See *Langius* as quoted by Porterfield, Ed. Med. Essays, vol. iii. p. 159. Such adhesions, when the interior of the eye is sound, admit of operation.

we may also perceive in the end of fever, and in acute hydro-cephalus. By our best physiologists, the position stands thus,—When the brain is oppressed, the muscles which are most directly under the will are the soonest affected, and to the greatest degree. The progress of the drunkard, from the first stage, when he attempts, in vain, to snuff the candle, to his finally falling under the table, gives proof of the gradual manner in which debility encroaches on the muscular system. First of all, his sight is affected, and he sees double ;* because the recti muscles, those of direct volition, soonest yield to the influence, and the obliqui, the involuntary muscles, prevail, so as to disturb the adjustment of the eyes.

" Double vision, then, is the deranged condition of the muscles of the eyes, by which the rays from an object are made to fall on points of the retina which do not correspond ; and two weaker images, instead of one stronger, are presented to the mind.† Still this distortion of the eye is not a squint, nor does it depend on the same cause.

" I have known a person who squinted, to be sensible of two images, one distinct, and the other very feeble. But, in general, he who squints sees single. The difference is manifest between double vision and squinting. In the former, both eyes are dis-torted, and on both the image is faint, because rays from the object do not fall on the central points,—the sensible spots of the

* " It is classical. Pentheus driven to fury by the Bacchanals, is made to see double ; two suns. Virgil Æneidos, iv. 369 ; Eurip. Bacchæ, 918 ; and Juvenal, sat. 6.

——jam vertigine tectum
Ambulat, et geminis exurgit mensa lucernis.—

† " In hemicrania and sympathetic pains of the head, the eyes suffer. Dexter oculus visu tantum non omni privatus si cum sinistro simul ad videndum aperitur omnia objecta sistit duplicata : hinc aliquid lecturus, scripturus aut exacte considera-turus, dextro clauso solo sinistro uti valet oculo, &c. *Hoffman, Cent.* i. *Sectio* i. *Cas.* iii. Double vision coming on in the adult, we fear that gutta serena may follow. Disput. Inaugural. Halleri, De Visu duplicato. Obs. iv. ; Ratione *eventus* in visum duplicatum *curabilem*, Obs. 1, 2, 5, 6 ; *incurabilem*, Obs. 4, 11 ; *lethalem*, Obs. 7 ; see also Briggs. With double vision we have Vertigo. It disappears when the patient shuts one eye and sees single, if it proceeds from derangement of the action of the muscle. A person with double vision from slight cerebral affection cannot see, he is afraid of losing his way. But on closing one eye, he sees perfectly. Here, when both eyes are used, the impressions are not made on the centre of either eye, and hence weakness and confusion of sight. See cases by Dr. Mac-kenzie of Glasgow, p. 302.

retinæ.   In the latter, that is, squinting, the defect is in one eye.
It is distorted, and the rays fall on the less sensible part of the
retina; whilst the sound or unaffected eye has the rays falling
on the sensible spot, and the sensation is distinct.   By and by,
the stronger image is alone contemplated, to the exclusion of
the weaker, and single vision is the consequence.*

A SQUINT—HOW PRODUCED—THE CONDITION OF THE EYE.

" A person who squints has one eye distorted; notwithstand-
ing which, he sees single, and is sensible of any defect.   If the
stronger eye be shut, he readily turns the weaker to the object.
Nor must it be forgotten that, when looking with both eyes, the
weak eye accompanies the strong in every motion, but always
preserving the same relation,—the axis of the weak eye deviat-
ing in a certain constant degree from that of the stronger one.
These facts do away with the idea that there is any one of the
recti muscles incapable of action; or that the cause of squinting
is any thing more than a certain degree of imperfection of the
muscular power.

" The following is a frequent occurrence, and it shows how
liable the external rectus is to derangement, and the effect of
weakness in it.   An elderly lady complains that she sees double.
It appears that this is only when she directs her eyes to the left
side.   I place myself before her, and she sees me correctly and
distinctly.   I move to the right side, and she still sees me single.
But when her head is kept steady, and I move to her left side,
and direct her to follow me with her eyes, she sees me double,
—she sees two figures, one-half of the one figure over the other.
I move a little farther to the left, and the images separate.   Still
as I move farther to the left the images are more separate, and
one is faint compared with the other.†

" We see here in an elderly person the progress of that defect
in the rectus externus, which leads to squinting.   When the ex-
ternal rectus of the left eye is relaxed, the imperfection is not

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* " I beg the reader to peruse the case cxii. of the Nervous System, and to
reason upon it.

† " See a case precisely similar, in the author's Nervous System, No. cxviii.

perceptible. The muscle is defective only inasmuch as it cannot fully contract, and therefore the eye cannot be directed outward to the degree that the other eye is directed inwards. The consequence is, that the impressions on the two retinæ no longer correspond,* and the more the right eye is turned toward the left, the farther are the impressions on the retinæ apart, and the farther the images seem to separate.

" With this state of the ball of the eye, the upper eyelid is sometimes relaxed and fallen. Nor should it surprise any one, who has observed that there is a natural connexion between the shutting of the eyelids and the inversion of the cornea, that both conditions should take place from the same influence,—the relaxation of the rectus externus and of the attollens palpebræ. The relaxed eyelid and the inverted cornea are frequent concomitants, however we may account for it. In every step of the inquiry we shall find occasion to revert to the natural conditions and actions of the eye.

" I have just examined a lady who sees naturally well, when the objects are near ; but at ten feet off, they are double. The reason is, that the eyes have a due power of converging ; but to be directly parallel, requires more action in the abducentes ; and they being weak, the parallelism is not perfect.†

" I have watched the commencement of a squint in a child, and have observed it from occasional distortion, to the confirmed strabismus. At first, mamma said, ' Sir, you are squinting :' —master was stuffing with apple-pie. The occurrence gave it the more interest to me ; and the parents being my friends, I watched the boy. When challenged, he could by attention, look straight ; but after a time he lost the power, and a most determined squint was the consequence, which now disfigures the man.

" I prefer, when I can obtain it, the opinion of an unbiassed observer. A friend writes—' To-day I had the opportunity of observing an incipient strabismus in a boy of eight years of age, while waiting with his mother in the hall of the hospital. I noticed the squint which was in his left eye, to be most mani-

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* " See Halleri disp. Anat. v. iv. De visione qua oculo fit gemino.

† " The same kind of defect was observed by Sir Everard Home, quoted by Mr. Mackenzie on Diseases of the Eyes. *Diplopia*. and Phil. Trans. for 1797, part. i. p. 7.

fest while he was sitting listlessly, apparently in a day-dream. On calling to him, and having his attention awakened, there was an obvious difference; the squint almost disappeared.'*

"In confirmed strabismus, joined to the distortion there is a defect in the retina itself. When the sound eye is shut and the squinting eye turned towards you, the sight is seldom strong ; very often when you hold up the watch, the patient cannot tell the hour,—perhaps not see the bars of the window. Here a question of practical importance arises—Is squinting purely a defect in the action of the rectus externus ; and is the weakness in the retina consequent on the distortion, from want of use ? or does the retina participate in the original defect ? Is the imperfection of vision concomitant or consequent ?

"When I examine a true case of strabismus, with the view of determining on the propriety of dividing the internal rectus, I find the pupil turned towards the nose, and after a time it is turned inwards and upwards. This proceeds from the relaxation of the superior oblique, and consequent prevalence of the inferior oblique.

"This, however, is no reason against the division of the internal rectus. But let it not be supposed a reason for dividing either of the obliqui. These are muscles provided for the preservation of the eye, and ought not to be deranged.

"Every thing tends to show that, in *strabismus*, the proper and common squint, the defect is in the relaxation of the rectus externus, and that the action of this muscle is impaired, not lost. It is the tendency of this muscle to relax, and not the increased power of the rectus internus, which is the cause of distortion. Were the action of the first altogether lost, then would the cornea be turned towards the caruncle ; and there it would remain, as when the muscle is accidentally divided in a wound.†

* "*Porterfield* believed that squinting might in some cases depend on the sensible spot of the retina being somewhat removed from the axis,—Edin. Med. Essays, vol. iii. p. 153,—a fancy to which I can give no credit. He speculates too much on the displacement of the humours of the eye in causing strabismus.

† "The complete division of the rectus externus causes the eyes to turn inwards. See *Sennertus*, as quoted by Boerhaave, *Prælectiones*, t. vi. dcccxlvi. The man had received a wound in the orbit, which cut the rectus externus. This turned the pupil towards the inner canthus. He afterwards had a wound which perforated his nose; 'et totâ vitâ suâ per vulnus et nasum, tanquam opticum tubum, objecta vidit !'

"In experiments on the monkey, the division of one of the recti muscles gives the ball entirely up to the action of the opponent. That the division of the internal rectus of the human eye, in those who squint, does not cause a distressing squint outwards, is owing to the weakness of the external rectus, and is an additional proof that the defect is there. An intelligent correspondent informs me, that a surgeon having cut the internal rectus of both eyes, the patient looked 'like a vicious mare going to kick.' This change from the 'bull-eye,' few would deem a happy effect of the operation.* But such must be the effect of cutting the internal rectus, if the external possesses all its power. There are circumstances in the anatomy of the orbit which explain the property in the eyeball of turning towards the nose when the rectus internus muscle has been divided. The orbit is oblique: the foramen opticum is nearer the mesial or central line than the eyeball, and the muscles diverge obliquely outwards to their insertion. By this position the superior and inferior recti have a power over the eyeball when the internal rectus has been divided. If we consider the habitual position of the eyeball in those who squint, it will appear that this action of the superior and inferior recti will be increased.† Such, I apprehend, is the reason that the pupil is not immediately turned out on the division of the internal rectus. It has not escaped the reader's attention, that the united action of the whole muscles of the eye is to turn the pupil inwards, and to squeeze the eyeball to the inner canthus when the organ is irritated.

"If the definition of a squint be correct, that the patient sees with one eye only, while the other is distorted and neglected, then he cannot squint with both eyes, though he may squint alternately with one or the other. A patient will look at an object with one eye only, and it is indifferent with which. If the object be on the right side, he will look at it with the left eye; if on the left, he will look on it with the right. Here there is no defect of the retina, and the abducens muscle of both eyes is weak, and hence the prevalence of the internal rectus in both, so that the

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* "The bull, when he levels his horns to the ground, has his eyes directed inwards and upwards. In death, especially in bleeding to death, the eyes are so distorted. 'Ita Plato ait, Socratem cum brevi ante mortem de anima disseret, *taurinum* inspexisse.'

† "See note xvi.

left eye is easily directed to the right, and the right to the left side.

"In a case of this kind, Dr. Darwin supposed the defect to arise from a depraved habit. I think it more probable that the influence, which deranges the action of the rectus externus of one eye, should affect both; my surprise being that, if the cause be in visceral disorder, and operating through the large connexion of the sympathetic nerve with the abducens nerve, both eyes should not be oftener affected. [See note at the end.]

"A respected friend and old pupil writes thus:—' The gentleman did not present any appearance whatever of squinting, till about the time when the ladies withdrew, namely, when we may presume the process of digestion was established.

" ' Both eyes were equally affected, and the squint consisted in each eye occasionally turning too much inwards.

" ' After much watching, and observing the effect of his directing his orbs (which were unusually prominent) to the objects on the table, I satisfied myself that he could direct either eye, with the natural degree of power, in any particular direction. But it seemed that, on each occasion of turning his eyes, he regarded the impression on one eye exclusively; that is, one eye appeared fixed in a true line on the object under his view, while the other eye squinted inwardly.

" ' For example, if he looked on a dish or decanter to his right side, the right eye had the object truly covered, but the left was penetrating to the cavities of his nose, or was turned to the glabellum, and *vice versa.*

" ' The explanation seemed to be this:—When looking to the objects on his right side, he employed the right eye, as being the one most favourably placed for viewing objects on that side, with a greater amount of volition, or a more positive effort of the will, than the left eye. He preferred, as it were, exercising this eye and attending to its impresssion, to using the eye situated unfavourably.'

"My friend proceeds to argue the matter ingeniously. I may state it thus:—The defect is in the rectus externus of both eyes. In looking aside, say to the right, the recti externi are in opposite conditions; the rectus externus of the right eye is active, the strong stimulus of the will is upon it in a state of contraction; the rectus externus of the left eye is in a state of negative

activity or relaxation. It is in this state that it exhibits imper-
fection, betrays weakness, and relaxes too much; consequently
the other muscles prevail, and the eye is distorted inwards.
Matters are precisely reversed when this gentleman looks to the
left side.

" These cases, differing from the common one of pure stra-
bismus, show that to judge of the precise condition of the eye
requires both knowledge and natural acumen, which, as I am
proud to say of a pupil, this last communication evinces.

" I have the less difficulty in believing that, in some rare in-
stances, the violent crying and convulsive struggling of a child
shall produce squinting, because in that state of excitement, what
we may call the natural condition of the eye, is exactly that of
strabismus; the cornea in passion being drawn inwards and
upwards. But, in common cases, every thing tends to persuade
us that the defect consists in a certain weakness of the rectus
externus. We see a squint produced under a crapulent state of
stomach; and at an early period, it is cured by attention to diet
and the state of the abdominal contents. As I have just said,
the relation between the great class of visceral nerves, the sym-
pathetic, is most direct with the sixth nerve, in its course to this
single muscle; so that the deduction from the anatomy corre-
sponds with our experience of symptoms.*

" The more that any one knows of the fine adjustment neces-

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* " Squinting is attributed to many causes. It is said to be hereditary; and so
it may be considered. But the cause is rather to be looked for in the disposition
to a certain disorder of the abdominal functions, than to a direct influence on the
eye. It is attributed to the position of the infant in respect to light, or to some
attractive object; to the habit of looking to its nose; to improper education, &c.
All this is misplaced ingenuity. It is equally an error to suppose, that when the
eye is defective in sensation, it is left to wander. The distortion is not a *wander-
ing*, but a necessary consequence of a certain defect of the outer rectus muscle,
in nineteen out of twenty cases.

" In treating of squinting, we must not forget that the muscles of the eye are
subject to a variety of derangements; and although the external rectus is most
frequently deranged, the other muscles are not exempted.

" ' Palpebrarum quoque et bulbi oculi, musculi non raro afficiuntur, ubi imi
ventris nervi irritantur. Quanta mutatio in oculis infantum observatur quorum
prima regio saburra acri repleta est? inordinate et rapide hinc inde moventur,
nunc sursum nunc deorsum, abconditis sub palpebris pupillis modo ad latera attra-
huntur modo extra orbitam pelluntur, vel intra ipsam deprimuntur; in aliis pal-
pebræ distrahuntur, bulbi figuntur, ut attente objecta aspicere crederes, somno licet
correptos hæc omnia horrorem adstantibus injicientia spectacula evanescunt,

sary to correct vision with both eyes, or the more he thinks of
the combination of muscles accessory to vision, the greater must
be his surprise that an operation so rude as that of dividing one
of the muscles, should have the effect of curing squinting. Rea-
soning *a priori*, one would say, that the effect must be to pro-
duce double vision, by bringing the images on the retina nearly,
and not absolutely to a correspondence ; and the surprise is rather
increased than allayed by the fact, that in some instances it has
the effect referred to. Why, then, is it not the same in all?
Because the person continues to see with one eye only.

" In the last twelve patients whom I have carefully examined,
operated on by different hands, one only has vision of the eye
which was cut. In that case, the sisters inform me, that she
did not always squint, but only occasionally ; and, ' as mother
thought,' only when her stomach was deranged.

" It is one thing to cure the distortion, another to cure the
squint and restore the perfect use of the eye. In the other cases,
the individuals do not use the eye operated on. The sensibility
of the retina is weak, and the image is obviously not regarded.
Perhaps this is a happiness, since in certain instances, double
vision has been produced ; and to see correctly, the person has
had to put his hand on one eye.

" The effect of cutting the internal rectus is not to destroy its
action finally and altogether ; but after a time the divided mus-
cle must form adhesions more or less directly to the eyeball.*
In a case seen whilst I am writing, the internal rectus was
divided, and I was disappointed in finding no effect at the first.
It is now the fourth day, and the distortion is quite removed.
We must conclude that the division and reunion diminishes the
power of the muscle, and reduces it to that state of action in

simulac alvus subducitur, vel vomitu acria expelluntur.'—*Rahn de miro inter Caput
et Viscera Abdominis Commercio*, § xiv.

" A case is related by Pamard, Journ. de Medecine, t. xxiii. p. 63, of a spasmodic
squint cured by a critical evacuation of the bowels ; and Borelli, Hist. et Obs. rar.
Med. Cent. ii. Obs. i. has a case of strabismus occurring in a woman on every
recurrence of pregnancy.

* " It is said we have no proof of the reunion of the muscle ; but we see it in
other instances ; at all events, it is pertinent to observe, that some of my friends
divide the tendinous insertion, others go back to the belly of the muscle and divide
it. See the last of the additional notes on the action of the rectus superior and
inferior.

which it is equivalent to the external rectus, and no more. Its reunion to the side of the eyeball, through the intervention of the cellular membrane, must be attended with considerable curtailment; and the happiest result is when that curtailment and consequent diminution of power correspond with the state of debility in the external rectus.

" The subject is highly interesting; the result truly surprising and beautiful. Here is an operation which removes a great striking deformity. We have yet to wait for results: ingenuity has been baffled; we must be patient for experience. Let not the operator promise perfect success as to the restoration of vision in the eye. What I have said will, I hope, stay the hands of those who without reflecting on the distinct action of the muscles, and devoid of the necessary experience, divide other muscles than the internal rectus. Before dividing the internal rectus, let the operator deliberate well on the condition of its opposite, the external rectus. If the affected eye be incapable of turning outwards when the other is shut, let it be ascertained whether this proceeds from weakness in the rectus externus, or from an adhesion on the inner side. Let the operator well consider whether deformity has arisen from disorder of the muscles merely, or from disorder attended with inflammation and with adhesion.

" I am a little sceptical on the subject of adhesion causing a squint, and its division being attended with perfect success. In a common squint there is nothing to produce inflammation and adhesion. The defect is in the muscles. That the internal rectus should be increased in power is not improbable. Nor is it impossible that it should degenerate. But, as in squinting, the weak eye moves freely when the strong eye is covered, it is evident that the distortion does not proceed from that cause.

ADDITIONAL NOTES.

"The manner in which I have studied the subject lately, has been to note the cases as they occurred, keeping to the facts simply. The reader may apply to them the reasoning in the text as an exercise.

" I. This young woman desires to know if she should have the 'new operation' performed upon her eye. The left eye squints—not always —it is irregular in its movements—the vision in the left eye is imperfect. She cannot tell the hour with it on my watch—nor see the bars of the window :—when she puts her hand on the right eye, she can distinguish me with the left—on raising the hand from the right eye, the left turns slightly towards the nose.

" My opinion is, that the operation will not improve her sight—the squint is not complete—it is more an unsteadiness from want of acute sensation. The effect on her countenance is hardly a blemish.

" II. I am requested to decide for or against the operation in this young lady's case. The left eye squints,—it is turned towards the nose, and a little upwards—a confirmed squint. On closing the right eye, she sees with the left, and can direct it fully in the circle. It was after the measles that she was observed to squint.

" The feebleness of the impression on the retina is no objection to the operation. I think she should submit.

" I saw this lady eight days after the *R. internus m.* was divided—the effect was good—the eye was unsteady; but nothing to deform an agreeable countenance. The fungus, which sometimes rises in the place of incision, is in this case very large; having been touched with caustic, it is at present ugly. It will disappear.

" III. Mrs. ———— squints inwards, not upwards, with her right eye. Sometimes she sees double ; when I retire from her to the distance of nine feet she sees two objects; when I hold the watch near, she does not see double,—in reading, she does not see double. She says, long before this proposal of cutting for squinting, she wished that something was cut which tied her eye. The eye is large; it is in consequence of the white part being turned forwards. When I make her cover the sound eye, and look at me, the eye appears to be diminished. She says, the double image is like the double rainbow, one distinct, and the other like its shadow.—*Operate.*

" [Eight days had passed.] The eye cut is now direct in the centre— she moves it outwardly to the full extent. It is with pain that she directs it to the nose. On the day succeeding to the operation she felt as if at sea, with an inclination to retch,—the room moved up and down—felt as if the room was unsteady.

" There is no such affection as authors describe, where particular objects are seen double and not others: ' Ubi quædam tantum modo objecta geminantur, reliquis simplicibus apparentibus.' They may see near things single, and far off things double; because they direct the eyes more easily with the axis converging, than when they are parallel.

" IV. This woman is satisfied with the success of the operation. She says, she sees with the eye operated on. She deceives herself as they all

do. She squints distressingly. I advised that after a considerable interval, the operation should be repeated with certain precautions.

" V. —— ——. His *Rectus internus* was cut in the left eye a fort-night ago. This man's eyes are in a very curious condition. His appearance is greatly improved, but there is a glimmer, which makes it difficult to say which eye is unsteady. He looks at me sometimes with one eye, some-times with the other. The eyes do not perfectly correspond. He says he sees best with the eye that has been operated on. This is not true; he cannot tell the hour on my watch with that eye, though readily with the other.

" [Second inspection.] He is not improving,—and I suspect he does not see in ordinary with the left eye. He has no double vision. On making him look to the left side, he cannot turn his left eye round to the natural extent. Is this debility of the *Rectus externus* or adhesion of the *R. in-ternus*?

" VI. A fine young man. Operation performed ten days ago. There is now no unpleasant distortion of the eyes—nothing to disfigure, or to be unpleasant in the countenance.

" But on carefully observing his eyes, there is a want of perfect consent. The eye operated on is more prominent than the other. The pupil is a little larger. He says he saw double at first. He sees an object as well when the left eye is closed, as when both eyes are open. He was cut on the left eye. The motion of the eye is free in all directions.

" VII. A respectable young woman; the eye was operated on by —— ——. It is perfect in all respects. Her sister tells me that she only squinted sometimes; and that mother says, it was only when her stomach was disordered.

" VIII. To-day Mr. —— brought me two patients on whom he had operated. The results very satisfactory. As he had operated on many, I asked him if he ever felt the necessity of dividing any thing like a ligamen-tous binding of the eye. He answered, Never; but he thinks that, in some instances, the muscle has been stronger than natural. He divides the muscle, not its tendon.

" IX. A fine young woman; the eye operated on, traverses freely—turns freely outwards—squinted at an early period. It was a very bad squint. She does not see double—cannot tell the hour on my watch. She appears not to attend to the impression on the weak eye.

" X. Mr. ——. I recommended this young gentleman to submit to the operation. Mr. ——, who operated on him, came to me this morning in some distress, on account of no change having taken place in consequence

of the division of the internal rectus. He expressed a wish that I should go and see the eye, and determine if he should do any thing more. I said, not now, if the eye is still directed towards the nose; the operation may be repeated hereafter; but nothing can be done now.

" Second day from the operation; he tells me the eye has become quite right, and is now directed straight forwards.

" Visited Mr. ———, and found the improvement as great as in the most favourable cases. *Quær.* Did spasm fix the eye, as I remember to have been the case in my experiments on dogs after having divided one of the recti?

" Jan. 3. This gentleman and his family are well satisfied with the operation. What I observe is this,—he does not commonly use the left eye. The vision in it is not perfect,—he can use it, and then the sound eye inclines a little inwards. The axis of the eyes are parallel in looking straight before him. But this is not from a just sympathy of action. He can turn the left eye in all directions; but not so far outwards as the right eye is turned inwards. He has no double vision—no pain in looking to the right or the left. His left eyelid hangs a little.

" XI. In observing this patient, cut three weeks ago, I find some things not a little puzzling. He says he saw double before the operation : he now sees single ! The distortion is cured,—the improvement complete. But as I make him look to the right and left, following my watch, which I hold up, the eye operated upon will make an irregular movement, upwards or downwards, or rapidly, first the one, and then the other. He says, the eye operated on is the strongest now.

" This irregular movement of the eye is an action of the obliqui—it is like the action of the eye in *Nystagmus Bulbi.* See appendix of the Nervous System, p. 374–5. See De Gorter, p. 250, ' Ut et motus instabilis et frequens Bulbi, qui Hippos vocatur.'

" XII. [By letter.] This lady squinted ; she could by an effort bring the eyes so nearly to parallelism as to satisfy her friends, that she could, if she chose, cure her squint. But when she thus satisfied them, by an effort, she saw double. She submitted to the operation of dividing the *M. Rectus internus.* The eye is restored to a correct position, but she sees double. By an act of volition she can see single ; but then it is observed, that the eyes are distorted.—What will be the final result?

" XIII. Double vision succeeding the operation for strabismus.

" A little boy (C. P.), came to get medicine for his sister. Observing that he squinted, I put some questions to him. Although a decided squint remains, it appears that he twice submitted to operations for its cure. He mentions, that both his eyes originally squinted ; and that in the left eye was much the worst ; nevertheless, he saw clearly. A surgeon, about five weeks ago, operated on this eye ; and the operation has been attended with remarkable success, so far as rectifying the position of the eye is to be taken into account ; for it has now lost all appearance of squint. It was afterwards

attempted, by a different surgeon, to make the cure complete, by operating on the right eye; but the result has proved unsuccessful, for a very obvious inversion of the eye in the direction of the glabellum remains.

"The patient, although a little fellow, shows clearly enough that he by no means congratulates himself on having fallen into the hands of the surgeons. He blames them for making his eyesight weaker. He now sees every thing double and confused; and to verify his statement, looks at various objects, and says that there appear to be two of each. He is too young to allow of our depending on his answers to more difficult questions; but on the above point he speaks emphatically.

"XIV. It has been objected that I have not explained the relation established between the visceral nerves, and the abductor, or rectus externus, of the eye.

"If it be acknowledged that the sympathetic system of nerves extends over the whole frame, to the head and extremities, as well as to the viscera, and that the only difference is, that in the extremities, the branches of this system are overlaid and obscured by the nerves of sensation and volition; or again, if this system is to have any centre at all, the conspicuous plexus, formed by the semilunar ganglion in the abdomen, may be taken as that centre.

"Irritation from disturbed functions at this centre, may, as it appears, be attributed to parts far remote, even the finger or the toe. But we have a more direct, and demonstrable connexion between this great centre in the abdomen, and the organs of sense in the head; and if what is termed the sympathetic nerve in the neck be traced upwards through the carotid foramen, we shall find it plunging into the second division of the fifth nerve, going to the cheek,—and even more directly, joining the abducens, or sixth nerve, viz.: that which is entirely given to the abductor muscle.

"Whilst, therefore, there are universal relations established through this system of nerves, we are not to be surprised that pairs are more frequently attributed to the second division of the fifth nerve, or that of the muscular system; the abductor muscle of the eye should be the most frequently affected through derangement of the abdominal functions.

"XV. Once more to measure the dimensions and form of the orbit, the position of the foramen opticum with regard to the globe of the eye, and the obliquity in the direction of the recti muscles. I went up to the rooms and dissected the parts within the orbit. But this investigation need not have been made; for I recollected a plan in Mr. John Bell's plates of the Bones and Muscles, which demonstrates beautifully (p. 54) the position of the eye-ball, the obliquity of the muscles, and the necessary difference in the length and direction of the straight muscles.*

"This position of the eyeball, and oblique direction of all the muscles, is not accidental; at all events, it is attended with this effect, that when the

* "He quotes Camper, Winslow, Petit; Academie des Sciences.

muscles are excited by irritation of the eye, the ball is drawn towards the os planum. I have noticed that, in this general excitement, the external rectus or abducens is relaxed. But I have here especially to remark, that, by the direction of the superior and inferior recti, they tend to turn the eye-ball inwards, and must, when the internal rectus is divided, prevent the eye from being distorted outwardly.

"If the eyeball should be turned inwards, as in those who squint, the course of these muscles, from their origins to their insertions, become more favourable to that action of directing the eye inwards; and this is the reason, I apprehend, that when the internal rectus is cut, the pupil sometimes continues to be turned inwards.

"XVI. 20th. This gentleman's eyes appear quite natural. The eye has been twice operated on. The first time the Rectus internus muscle was divided The second time the internal edges of the superior and inferior rectus were divided. He is a sensible person, and says, as to the vision of the eye operated on, there is no improvement. He sees the face of the watch with that eye, but not the hands."*

TREATMENT OF STRABISMUS.

The treatment of this disease will depend very much upon its cause. If it should arise from disease of the brain, from amaurosis, from morbid condition of the sixth or third pair of nerves, little benefit may be expected from general or local means. But if it proceed, as often happens, from teething, from worms, from violent passions of the mind, disorder of the digestive organs, irritation, temporary injuries, from partial exposure of one eye to the light, from want of power in one set of muscles or inordinate strength in the other, much may be done towards effecting a cure, partly by constitutional remedies, and partly by mechanical contrivances, or by an operation. Every effort should be made, then, to accomplish such a purpose, before resorting to the latter measure.

In the year 1818, while practising my profession extensively in Baltimore, the late Mr. B. J. consulted me about his daughter, a child of eleven or twelve years of age, both of whose eyes were directed very much inwards, and were thereby greatly deformed by a squint. I advised a pair of goggles, so contrived, by having a small opening in the centre of each, as to oblige the child to direct the cornea to these openings, and by perse-

* Here ends Sir Charles Bell's Essay.

verance for several weeks, succeeded in diminishing the deformity, but not in effecting a cure. In the course of my visits the child remarked, at different times, that her eyes felt as if tied by a string. Struck with the observation, and conceiving the disease might depend upon shortening of the internal rectus muscle, I determined, the first opportunity, to try the result of division of that muscle; and as the friends of my young patient were unwilling the experiment should be first tried upon her, I selected a hospital patient, and after some difficulty in fixing the ball, and in cutting the muscle across, succeeded in restoring the eye partially to its natural situation. Upon two other patients I repeated the experiment, without much better success, but upon dividing the muscle in a fourth patient, after my removal to Philadelphia, the eye was so completely turned to the opposite direction as to bury the cornea beneath the lids, and create a much greater deformity than had previously existed. Upon showing the patient to Dr. Physick, he advised the experiments to be abandoned, as likely to be followed by very unfavourable results. I mention these circumstances, not from a desire to receive credit as an inventor, or to detract from the claims of the distinguished surgeon with whom the modern operation of strabismus originated, but merely as a curious fact, calculated to show the importance of not hastily laying aside processes apparently founded upon correct principles, simply because we are at first foiled in our attempts to execute them. How much benefit would have resulted to the community, if I had followed up my operations, until I ascertained the proper mode of conducting them, or how much injury I might have inflicted upon individuals by perseverance in the attempt, I shall not stop to inquire. It is sufficient for me to announce the fact,—which I have no doubt could be easily substantiated by many pupils who attended my early lectures, some of whom have indeed already profered their testimony,—without being over solicitous, in setting up a claim as an inventor, of exposing my awkwardness and perhaps want of knowledge of the principles that should have guided me in following out the practice I had attempted to institute.

About the year 1839 Dieffenbach, the celebrated surgeon of Berlin, first turned his attention towards the removal of strabismus by an operation. On the 28th of March, 1840, he had

operated on forty-one cases, all of which, at the end of a fort-
night, had proved successful. By the 4th of July following,
his number exceeded three hundred, and, up to the present time,
he has performed more operations of the kind, it is said, than
any surgeon living, and, comparatively, with much greater suc-
cess. On this account I shall here insert a long extract, copied
by the British and Foreign Medical Review from Casper's Woe-
kenscrift, and drawn up and published in the latter work by
Dieffenbach himself.

" The youngest individuals in whom I have undertaken the
division of the shortened muscle of the eye were five years old;
the oldest were upwards of forty.

" Sometimes one, sometimes both eyes squinted, and the ope-
ration had generally the same favourable result in both cases.
When both eyes were affected I either operated first on that
which squinted most, and when that was quite well on the other,
or else on both at the same time.

" Squinting inwards, from shortening of the rectus internus,
was by far most frequent. Sometimes the trochlearis muscle
was also shortened, so that it was necessary to divide it as well
as the rectus. In the whole number of those I operated on there
were only a few who squinted outwards, and still fewer in whom
the eye was directed upwards or upwards and inwards. I found
no eyes at all that squinted downwards.

" Strabismus upwards was sometimes complicated with ble-
pharoptosis. The division of the rectus superior not only cured
the squinting, but the ptosis gradually diminished after it.

" Strabismus outwards or inwards was often complicated with
nystagmus bulbi. After the division of the external or internal
rectus not only did the squinting cease but in general the nys-
tagmus also. In other cases, however, the latter was persistent,
and did not decrease till after the division of the rectus superior,
or obliquus superior, or rectus externus.

" When cataract or strabismus coexisted, the operations for
both were done at the same time, and the result was in every
case favourable to both.

" In most of the patients the strabismus had commenced in
very early childhood after ophthalmia neonatorum, scrofulous in-
flammation of the eyes with ulcers on the cornea, or after acute
exanthemata, &c. In many there were cicatrices on the cornea

or cataracta centralis. In cases of the former kind, in which hitherto artificial pupils would have been made, the operation was attended by success and considerable improvement of the sight.

"All those who had strabismus of only one eye saw more weakly with it than with the other; in those who squinted with both eyes that which was turned least was usually the stronger. The weakness of the one eye had been observed by only a few of the patients; they had naturally looked only with the better eye and the other had been unemployed. The operation completely cured the weakness of sight; some who had actually amaurotic amblyopia could see clearly directly after it was performed.

"Some of the patients previous to the operation often saw double; this defect continued for some time after it and then gradually ceased. Some others who had never seen double before did so immediately after the operation. These had been in the habit of looking only with the strong eye while the other had been unused. The improved position of the latter compelled it to see, but the double vision was subsequently lost.

"Some who were operated on did not see so well immediately after as before the operation; but after some exercise this weakness of vision ceased and they could then see quite clearly. The cause of this was that when the eye was put in its normal position a point of the retina which was before unexercised was now brought into play, and required some practice before it could fully discharge its function.

OPERATION.

"That for strabismus convergens is here taken as the type. The operator always stands on the right side of the patient whether he be operating on the right or on the left eye. The patient sits on a stool, and an assistant, standing behind him, draws up the upper eyelid with a Pellier's hook. A second assistant draws down the lower eyelid with a double hook, which is set in a handle, and of which the teeth are connected by a transverse piece. He kneels down before the patient so as not to be in the way.

" The operator then puts a fine hook into the conjunctiva at the inner angle of the eye, just where it is passing from the palpebræ to the bulb, passes it superficially through it, and gives it to a third assistant who stands on the left side of the patient. The operator next passes a second hook in the same way through the conjunctiva about a line and a half from the first. He and his assistant then both at the same time draw their hooks a little up, so as to raise a fold of the conjunctiva, and at the same time pull the bulb somewhat outwards. The fold is then divided with a pair of curved eye-scissors; and this cut usually at once exposes the tendon and the anterior part of the muscle. A couple of cuts with the scissors then expose the outer surface of the muscle; a rather blunt hook is passed under its tendon, and the two sharp hooks that held the conjunctiva are now removed; the eye is held completely in the power of the blunt hook, and is to be drawn by it from out the internal angle of the orbit. A flat probe is then pushed under the muscle; and the loose connexion by cellular tissue between it and the eye is broken up. The division of the muscle is made by the scissors already mentioned, either, first, through the tendon in front of the hook; or, second, behind the hook at the beginning of the muscular substance; or, third, some lines deeper back.

" When the tendon is divided nothing of it remains on the eye, and the muscle commonly retracts a line backwards. When the muscle itself is divided at its anterior part or further back, its posterior portion retracts, and the anterior, which remains connected with the bulb, turns forwards like a loose flap, which, according to circumstances, may be removed by the scissors or pushed back into the wound if it is thought desirable that it should unite again with the posterior portion.

" In practised hands the whole operation seldom lasts more than a minute; and it is done almost without pain. When finished, the eye is cleaned with cold water and a soft sponge. The after-treatment consists of cold lotions, and very great abstinence from food and strong drinks. The patient should be kept in a darkened room. In most cases the wound heals very quickly, and after a few weeks no traces of the operation remain, and the eye stands in its normal position.

" The operation for internal strabismus is by far the most easy; the division of the obliquus superior for squinting upwards

and inwards is more difficult; that of the rectus externus for strabismus divergens is more difficult still; and the most difficult of all is the division of the rectus superior for squinting upwards. With respect to the manipulations of these operations they are just the same as those for strabismus convergens.

REMARKS ON THE OPERATION.

" The fixing of the upper and lower eyelids with the elevator and the hook, so as to expose the whole of the anterior surface of the globe, is indispensable, for neither the will of the patient nor the separation of the lids by the fingers can do this effectually.

" The fixing of the globe can be accomplished only by fine hooks carried superficially through the conjunctiva; the seizing and elevation of the fold of conjunctiva by forceps sounds more gentle than to do it with a sharp hook, but it is in reality far more painful, more injurious, and more insecure; the fold raised up by the forceps easily tears or slips from their grasp, and if the forceps are made with hooks they wound as well as pinch the membrane. Two hooks must be employed to make the fold tense enough.

" The great number of operations that I have performed has given me opportunity of observing the phenomena that ensue subsequently to them, and their after consequences. The question here is only of internal strabismus, but any surgeon will easily supply the necessary modifications for the operations in the other varieties. In the first case the eye, after the division of the muscle, goes into its normal position. In the second, it remains in some degree squinting. In the third, it turns outwards.

" In my first operations the position of the eye after the division of the muscle was left to chance, but I gradually succeeded in getting it into my own power to determine it. If there be the slightest degree of convergent strabismus, only a very small opening should be made in the conjunctiva, and the tendon only divided close to the eye without separating the muscle from the globe. In this case the eye at first almost maintains its previous position, but after some weeks it becomes straight. If the conjunctiva be more extensively divided, and if the under surface

of the muscle be separated from the globe with a probe and then
cut across, the squinting is at once nearly or completely re-
moved. If the conjunctiva be divided over a greater arc and
towards the back of the globe, if the cellular tissue be exten-
sively separated and the muscle be detached far back and divided
at its middle, then the eye, even in cases in which the whole
cornea was before hidden in the internal angle, stands quite
straight after the operation.

" Hundreds of those whom I have cured have been seen by
our own and by foreign medical men, and it was often impos-
sible to distingiush the eye that had squinted from the other.

" In some who still squinted slightly after the operation the
position of the eye was made perfectly normal by tying up the
sound eye and rolling the globe forcibly outwards so as to stretch
the newly-formed uniting substance. In others of those whom I
first operated on, in whom I had not adopted this after measure,
I repeated the operation; and I found in fourteen days after its
first division the muscle was again intimately united with the
globe, and that, with the exception of a slight thickening and
induration of this part, there was no indication of a previous
operation.

" Immediately after the operation the eye can be moved
inwards by the superior oblique, and at a later period by the
divided muscle which has again united with the globe. In
several persons in whom the muscle was divided deeper in the
orbit, the eye turned outwards some weeks after the operation,
so that there was actually an external strabismus. If the diver-
gence was but slight it was often sufficient to snip (*betupfen*) the
conjunctiva at the inner angle, so as by the shortening of the
membrane that was thus produced, to bring the eye into the
middle. But if the divergence was greater, I then divided the
external rectus, and the eye became straight again, especially
when I at the same time removed a fold of conjunctiva from
the internal angle, for the cicatrix that then followed tended to
draw the globe inwards. If the eye, notwithstanding the divi-
sion of the external rectus, still remained turned outwards, I
then, after dividing and separating that muscle, tied a thread as
fine as a hair upon its tendon, and with this pulled the eye
forcibly inwards. The end of the thread was then drawn tightly
across the bridge of the nose and fastened to a piece of good

adhesive plaster, which was stuck upon the opposite side. The result for the most part surpassed my expectations."

Since this report of Dieffenbach, the operation for strabismus has been performed innumerable times, in all countries, with more or less success—in some instances with perfect restoration of sight and without a remnant of deformity; in others with violent inflammation and disfigurement of the patient, and even with loss of the eye. These latter results are to be traced, no doubt, to the *pruritus* with which many *physicians* are afflicted to perform such operations as are considered *easy*, or managed with a modicum of skill—so that persons, wholly incompetent, are too often tempted to dash, unhesitatingly, at what they consider within their reach, and are only to be convinced by repeated failures that they have no turn for such exploits. The observation applies not to strabismus only; for I well remember when *lithotrity* was first announced, how eagerly every tyro in Europe and this country, and even common instrument-makers out of the profession, jumped at the opportunity of displaying their skill; men who never would have dreamed of performing lithotomy or hernia, and whose boldest flights never extended beyond the twopenny exploit of nicking a tendon in club-foot, or cutting out the corner of an inverted toe-nail. The time will come then, I have do doubt, when the operation for strabismus will be considered sufficiently delicate and difficult to be worthy the attention of scientific and practical surgeons, and be entrusted to their care, instead of being placed, as it is at this moment, in many parts of the world, in the hands of unprincipled surgical traders and quacks, whose impositions upon the public are bolstered up by patients and puffers, about as ignorant, in such matters, as the soi-disant operators themselves.

On Diseases of the Eye, consult Scarpa's Practical Observations, on the Principal Diseases of the Eyes, translated from the Italian, with Notes, by John Briggs, 2d edit.; Ware's Chirurgical Observations relative to the Eye, in 2 vols. 8vo.; Wardrop's Essays on the Morbid Anatomy of the Human Eye, in 2 vols. 8vo. Edinburgh, 1808 and 1818; Vetch's Practical Treatise on the Diseases of the Eye, 1820; Travers's Synopsis of the Diseases of the Eye, and their Treatment, 1820; A Treatise on some Practical Points, relating to the Diseases of the Eye, by the late John Cunningham Saunders, 8vo. 1811; Practical Observations on Ectropeon, or Eversion of the Eyelids, with the Description of a new Operation for the Cure of that Disease, on the Modes of Forming an Artificial Pupil, and

on Cataract, by William Adams, 8vo. 1812; An Essay on the Entropeon, by Philip Crampton, M. D. London, 1806; Wenzel's Treatise on Cataract, by Ware, 1791; Pott's Remarks on Cataract, in vol. iii. of his Chirurgical Works; Hey's Practical Observations in Surgery; A Practical Inquiry into the Causes of the frequent Failure of the Operations of Depression, and of the Extraction of the Cataract as usually performed, with the Description of a Series of New and Improved Operations, &c., by Sir William Adams, 8vo. 1817; Practical Observations on the Formation of an Artificial Pupil, and Remarks on the Extraction of Soft Cataracts, By Benjamin Gibson, 8vo. 1811; A Practical Treatise on the Diseases of the Eye, by William Mackenzie, 8vo. London, 1830; A Treatise on the Venereal Diseases of the Eye, by William Lawrence, London, 1830; Lectures on the Operative Surgery of the Eye, by J. G. Guthrie, London, 1827, 8vo.; A Manual of the Diseases of the Eye, by S. Littell, M. D., Philadelphia, 1837, 8vo.—an excellent little work, and well deserving the attention of the American student; A Treatise on the Diseases of the Eye and its Appendages, by Richard Middlemore, in 2 vols. London, 1835.

CHAPTER XI.

DISEASES OF THE EAR.

From the complex structure and diminutive form of the auditory organs, the older surgeons always despaired of arriving at any certain knowledge of the nature and treatment of their diseases. Hence, all the information we possess on the subject, may be considered, comparatively, of modern origin. Still we are much in the dark, and may, perhaps, for ever continue so, respecting many affections, especially those of the internal ear. For these very reasons, however, the student, instead of neglecting, as is too common, the anatomy of the ear, under the impression that he can never acquire an accurate knowledge of it, should strive to make himself minutely acquainted with its most intricate structure, as the only means of understanding its diseases, which after all are not in reality so complicated and obscure, as is commonly imagined. Much assistance, also, may be obtained from a simple and accurate classification of these diseases—such as I shall endeavour to present in the ensuing sections.

SECTION I.

DISEASES OF THE EXTERNAL EAR, AND MEATUS AUDITORIUS.

The external ear may be separated from the head by a sabre cut, or by a cannon-ball, or it may be bitten off. It is sometimes frost-bitten, and sloughs away; at other times, it is destroyed by ulceration. Formerly it was supposed that such accidents or diseases would necessarily be followed by loss of

hearing; but experience proves the reverse; indeed, cases are recorded of patients born without external ears, who, nevertheless, enjoyed to a certain extent the sense of hearing. Of the individual parts of the ear, the lobe is the most subject to disease. In several instances, I have known sarcomatous tumours to spring from it—in shape resembling the vegetable called prickly-pear—which have sometimes attained a large size. In all these cases, the disease was met with in negroes, and seemed to originate from brass ear-rings worn by the patients. By Alibert, the term cancroides has been applied to tumours of this description. Encysted or steatomatous tumours of the lobe are very common. They generally occupy the centre, and seldom increase beyond the size of a pea.

The *meatus auditorius* is liable to accidents and diseases. Extraneous bodies, such as peas, stones, glass beads, pieces of slate-pencil, cherry-stones, bits of wood or metal, are frequently put into the ear by children; and by lodging at the bottom of the meatus, or upon the membrana tympani, excite irritation or suppuration. Sometimes insects find their way into this passage, and produce great alarm to the patient, as well as pain. Worms also may be generated within the meatus, in consequence of the eggs from which they are produced, having been deposited by flies during the patient's sleep. At other times, worms creep into the ear, as in the following instance. Several years ago, a poor woman, the wife of a skin-dresser, brought her child to me, stating that a few days before, the child had been playing with its companions on a pile of sheep wool that lay in the yard; and that in a few minutes after, he complained of uneasiness in the ear, which was soon followed by violent ear-ache, and subsequently by suppuration. To relieve the pain and check the discharge, the mother poured sweet oil into the ear, and in a few moments, to her great surprise and horror, observed a worm make its appearance near the surface, but upon attempting to seize it, it immediately retired beyond her sight and reach. Scarcely giving credit to the woman's statement, I repeated the experiment with the oil, and in a few seconds the worm appeared, its approach being preceded by several bubbles of air passing through the oil. I tried instantly to secure it with a pair of slender forceps, but with great dexterity it eluded the grasp, and made its escape. Several

times the attempt was repeated, and at last, with success. When placed on the table, the animal was found three-quarters of an inch long, about as thick as a common piece of twine, black about the head, and white on the rest of its body. It was extremely active, and appeared very tenacious of life. The woman immediately recognized it as a species of worm very commonly met with amongst new-shorn wool, and had no doubt that it had found its way into the boy's ear at the time he was playing on the pile. Cases, in some respects, similar to this are recorded by Acrell, Valsalva, Morgagni, and others.

The *cerumen*, or wax of the ear, often accumulates in undue quantity, and forms an inspissated mass, which may interrupt or destroy the hearing.

Suppuration of the lining membrane of the meatus auditorius, is a very common affection, especially amongst infants and young children, in whom it arises from cold, want of cleanliness, &c. When the discharge is profuse and long-continued, it becomes, particularly during warm weather, very offensive, and if not checked, may eventually destroy the membrana tympani and small bones of the ear.

Polypi of the meatus, are occasionally met with. They spring from the bottom of the passage, or from the sides of the membrane. In either case, they generally increase until they fill up the whole cavity, and project beyond the orifice, so as to render the patient partially or entirely deaf.

An *herpetic eruption* is another complaint to which this passage is subject. It is rather frequent than otherwise, and occurs chiefly in scrofulous patients. The discharge from the sore is extremely offensive, and sometimes so profuse, thick and viscid, as to block up the passage. Occasionally, the eruption extends beyond the meatus, and affects the external ear.

Children are sometimes, though very rarely, born with the meatus auditorius imperfect. This may proceed from a thin membrane covering the orifice of the passage, or seated some distance within it, or from the whole tube being filled up by a tumour, or by a coalescence of its sides.

TREATMENT OF DISEASES OF THE EXTERNAL EAR.

For sarcomatous tumours of the lobe of the ear, there is no other remedy than excision, and this commonly succeeds. Encysted, or steatomatous, tumours if they attain a sufficient size to produce deformity, or to become troublesome, may be dissected out in the same manner that they are removed from other parts of the body. Cancroides may be removed successfully sometimes; but in most cases of the kind I have met with, the tumours have returned, and in a few instances, the operation has been followed by violent symptoms and even death.

Extraneous bodies introduced into the meatus auditorius, if attended to before they excite inflammation and swelling, may generally be removed by a pair of very slender forceps. Beads, cherry-stones, and shot, however, are always difficult to seize, on account of their round form and smooth surface. Upon one occasion, after having ineffectually tried to extract a pea from the ear of a child by the forceps, I succeeded in splitting it with a couching needle, and then removed the pieces without difficulty, by throwing in a stream of water from a syringe. A bent probe will sometimes answer a better purpose in the removal of an extraneous body than any other instrument, with exception, perhaps, of that beautiful and ingenious contrivance, the curette articulée of Leroy.* Insects that find their way into the meatus, or are generated in the passage, are easily gotten rid of by pouring olive or any other mild oil into the ear. The oil obstructs the pores of their respiratory apparatus and obliges them to come to the surface. They may also be destroyed by the smoke or infusion of tobacco, or by other stimulating articles. *Hardened wax* is easily removed by the repeated use of the syringe and ear-pick. Warm water, or soap and water, are the best solvents for this wax.

Suppuration of the lining membrane of the meatus auditorius may be relieved or removed, in most instances, by antiphlogistic remedies, and by moderately astringent injections, provided the disease is attended to in its commencement. The

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* See article Lithotripsy.

passage should be protected during cold weather by a dossil of wool introduced into its orifice.

In scrofulous children it is not uncommon to meet with offensive discharges from the ear, which have continued for years. In all such cases I have derived great benefit, and sometimes effected perfect cures, by fumigating the passage with æthiops mineral. A small portion of the powder may be strewed on a heated iron and held close to the ear, or the fumes may be conveyed more accurately to the part by collecting them in a tin vessel resembling an ear trumpet. The operation should be repeated two or three times a-day.

Polypi of the ear, if not too deeply situated, may be extracted by slender forceps ; but the operation is a delicate one and requires considerable skill. The ligature recommended by some surgeons, cannot be employed with advantage. The application of lunar caustic is sometimes rendered necessary to destroy the remnants of the disease.

For the removal of *herpetic* eruptions, mercurial preparations are the most serviceable, especially the internal use of calomel, and a weak solution of corrosive sublinate, as an injection.

The *imperforate* meatus auditorius has so etimes been restored by dividing the membrane which blocks up the passage, and afterwards wearing a tent to keep it from closing. When the sides of the tube are firmly united, and all remains of the original meatus obliterated, an operation will seldom prove successful.

SECTION II.

DISEASES OF THE TYMPANUM AND EUSTACHIAN TUBE.

OTALGIA or ear-ache, a very common, and sometimes most severe affection, is generally the result of acute inflammation of the membrane lining the cavity of the tympanum.   The pain is excessive, and extends, in many instances, from the ear to other parts of the head, accompanied by fever and delirium.   If these symptoms continue for any length of time, suppuration is almost sure to ensue, and matter collects not only in the cavity of the tympanum, but in the mastoid cells and Eustachian tube.   This matter is generally ichorous and sometimes sanious.   When copiously secreted, it destroys by pressure the membrana tympani, and is discharged at the meatus externus, not unfrequently along with one or more of the small bones that occupy the tympanum.   From this cause, and from obliteration of the Eustachian tube by inflammation, permanent deafness is extremely apt to follow.   Caries, too, of the tympanum and mastoid cells, complicated with fungus, is a frequent consequence of this distressing disease.

The *Eustachian tube* is frequently closed, independently of any affection of the tympanum—from the sloughing or ulceration which sometimes follows cynanche maligna, scarlet fever, cynanche tonsillaris, syphilis, the immoderate use of mercury, and other diseases.   In all such cases, partial deafness ensues, owing to the air within the tympanum being confined, or absorbed, or to the cavity being filled by mucus.   The membrana tympani, in either event, is incapable of the requisite degree of vibration, and the patient's hearing is thereby rendered very indistinct, or entirely destroyed.   It is not always easy to discriminate between this variety of deafness and that proceeding from other causes.   Much information may be gained, however, from accurate inquiries into the history of the complaint, and by directing the patient to close the nos-

trils and mouth, and blow forcibly with his breath, which, if
the Eustachian tube be closed, will not enter the cavity of the
tympanum and communicate an impulse to its membrane or
drum, as generally happens when the guttural extremity of
the tube is pervious. Moreover, patients deaf from closure of
the Eustachian tube, are seldom disturbed by those unpleasant
sounds in the ear which so commonly accompany nervous
deafness.

TREATMENT OF DISEASES OF THE TYMPANUM.

A most absurd and highly pernicious practice is frequently
pursued in the treatment of inflammation of the membrane lining
the tympanum—that of pouring stimulating or acrid fluids into
the meatus externus, with a view of relieving the intense pain
accompanying the disease. Instead of this, general and topical
blood-letting, purging, and blistering, in the commencement of
the disease, are the proper remedies. If by these means suppu-
ration be not prevented, and the matter is rapidly accumulating,
the surgeon, without delay, should make a small opening with
a sharp-pointed probe or couching needle in the membrana
tympani, and evacuate the matter; otherwise, the whole of this
membrane may be destroyed by ulceration, the ossicula dis-
charged, and the hearing irrecoverably lost. After the inflam-
mation has subsided, astringent injections may be employed to
correct and suppress the discharge. If fungous or polypous
excrescences sprout from the tympanum and fill up the meatus,
they should be removed by the forceps and lunar caustic. Gene-
rally nothing less than trephining the mastoid cells will do any
good in cases of caries of that process; though I have some-
times checked the disease by fumigation with æthiops mineral.
It is proper to state, however, that some surgeons have con-
demned altogether, the trephine in this disease. An interesting
case of this description, I attended lately with my friend, Dr.
Cock, an eminent physician of New York. The patient had
been seen by Sir Astley Cooper, and by Roux, who declined
operating, saying that any attempt of the kind would probably
prove fatal.

For the relief of deafness arising from obliteration of the Eus-

tachian tube, an ingenious expedient was suggested, long ago, by Chesselden, and afterwards practised by Sir Astley Cooper— the perforation of the membrana tympani. This operation, as was correctly imagined, served the purpose of admitting the external air to the tympanum, and thereby, for a time, restored the patient's hearing. It was soon found, however, in most instances, that the benefit was temporary—owing to the inflammation excited by the puncture, producing an induration of the membrane, and a consequent loss of vibratory power. The opening in the membrana tympani, in other cases, moreover, was found to close speedily after the operation. For these, and some other reasons, the operation is now seldom practised. Should it ever become necessary to resort to it, a small sharp-pointed probe will answer all the purposes of the regular and more complicated instruments—care being taken to select such cases of deafness only, as are dependent upon closure of the tube, and, in performing the operation, to avoid perforating that part of the membrane to which the handle of the malleus is attached.

Some of the English and French surgeons have contrived instruments for cleansing the Eustachian tube, when clogged with mucus or extraneous bodies. The difficulty, however, of introducing the pipe of a syringe or probe into the guttural extremity of this passage, has deterred most persons from attempting the operation, and even when it has been practised with facility, and continued for months by those who have taken pains to acquire the requisite dexterity, I have known very little permanent benefit to result.

THAT variety of deafness, usually called *nervous*, is exceedingly common, and arises, for the most part, from some organic defect, or change in the structure of the auditory nerve. The membrane, also, upon which the nerve is expanded, and the fluid which it contains, may undergo such alterations as to render them unfit to perform their proper functions, and from these causes there is reason to believe that nervous deafness frequently proceeds. So far as inferences can be drawn, from the appearances presented upon dissection, the following circumstances may be enumerated as likely to interfere materially with the sense of hearing; 1st, an unusual hardness of the auditory nerve; 2dly, a diminution of the nerve; 3dly, a thickening of the membrane of the labyrinth; 4thly, the formation of a steatomatous or caseous substance within the cavity of the vestibule; 5thly, calcareous matter in the vestibule; 6thly, malformation of the vestibule, semicircular canals, and cochlea. If, from these or other causes, nervous deafness should arise, it will be indicated, in most instances, by tinnitus aurium, or ringing in the ears, by unpleasant and peculiar sounds resembling the dashing of waves, the murmuring of bees, the roaring of a cataract or water-fall, the hissing of a tea-pot, the rustling of leaves, the singing of a conch or shell, the vibration of the stethoscope, and many other strange, and, to the patient, unaccountable noises. These symptoms are most urgent during the winter, at night, and in cloudy weather, and whenever the patient has taken cold. Most patients, indeed, troubled with nervous deafness, are peculiarly susceptible of cold; from this, and from other causes, there is a diminution of the ceruminous secretion, and, consequently, a peculiar dryness or huskiness of the meatus auditorius. Despondency is a frequent concomitant of nervous deafness. Children, totally deaf,

at birth, from some permanent organic defect of the internal ear, necessarily remain dumb.

TREATMENT OF DISEASES OF THE INTERNAL EAR.

For confirmed nervous deafness, unfortunately, there is no remedy, though much may be done towards arresting the progress of the disease whilst in the commencement. The chief indication, generally, is to reduce the patient by blood-letting, purging, and low diet; after which, a blister behind the ear, or a succession of blisters, will often prove highly beneficial. In addition to this treatment, the patient should be directed to guard, carefully, against cold or exposure, by protecting the feet, wearing in other respects suitable clothing, and by avoiding a current of air. The free use of common salt applied to the skin, or rubbed among the hair of the head, will be found to contribute very much to this end, and was frequently prescribed by the late Dr. Physick in cases of nervous deafness accompanied by great susceptibility of cold. Nervous deafness from syphilis is by no means uncommon, and may generally be removed radically by a course of mercury. In many incurable cases of deafness, the patients derive great assistance from the use of ear trumpets, one of which, lately invented in France, in the shape of a flexible tube, eighteen or twenty inches long, has been found extremely useful, and far superior to any other instrument of the kind I have met with. In England, too, recently numerous instruments under the name of cornets have been extolled by Scott and others. Most of them, however, are not to be depended upon; and some have proved decidedly injurious.

See The Anatomy of the Human Ear, illustrated by a Series of Engravings, of the natural size, with a Treatise on the Diseases of that Organ, the Causes of Deafness, and their proper Treatment, by the late John Cunningham Saunders, 8vo. 1817; A Treatise on the Physiology and Diseases of the Ear—containing a Comparative View of its Structure and Functions, and of its various Diseases, &c., by John Harrison Curtis, 8vo. 1817; An Essay on the Human Ear, its Anatomical Structure and Incidental Complaints, &c., by W. Wright, 8vo. 1817; Observations on the Effects which take place from the Destruction of the Membrana Tympani of the Ear, by Sir Astley Cooper, 4to. 1800; Further Observa-

tions on the Effects which take place from the Destruction of the Membrana Tympani, with an Account of an Operation for the Removal of a particular species of Deafness, by Astley Cooper, 4to. 1801 ; Richerand's Nosographie Chirurgicale, ou Nouveaux Elemens de Pathologie, tom. ii. p. 135 ; Dictionnaire des Sciences Medicales, tom. xxxviii. p. 24, article Oreille ; Rosenthal, Essai d'une Pathologie de l'Organe de l'Ouie, in Journ. Complement, du Dict. des Sciences Med. tom. vi. ; Memoire sur la Theorie des Maladies de l'Oreille, et sur les moyens que la Chirurgie peut employer pour leur curation, par M. Leschevin, in Memoires sur les Sujets proposes pour le Prix de l'Academie Royale de Chirurgie, tom. ix. p. 111, edit. duodec ; I. M. G. Itard, Traité des Maladies de l'Orielle et de l'Audition, 2 tomes, 8vo. Paris, 1821 ; Buchannan's Illustrations of Acoustic Surgery, Hull, 1825, 8vo.; Cock, in Med. Chirurg. Transact. vol. xix.; Kramer on the Ear, &c.

CHAPTER XII.

DISEASES OF THE ARTERIES.

THE arteries, like most other textures, are supplied with blood-vessels, nerves, exhalants and absorbents, and are made up of coats or coverings, differing from each other in structure, consistence and tenacity. Hence, they are subject to many diseases to which other soft parts are liable ; whilst, at the same time, they possess powers of resisting disease peculiar to themselves. To understand their diseases, an accurate knowledge of their structure and conformation is very necessary—though the study is commonly much neglected by students.

There are three coats to an artery—an external, middle, and internal coat. The external coat is composed of condensed cellular membrane, is remarkably elastic and tough, of a pure white colour, smooth on its inner surface, and rough on its outer, where it is in contact with a cellular sheath or an additional investment. The *middle* coat is uncommonly thick, and appears to consist of muscular fibres arranged in a circular direction. There is every reason to believe, however, that these fibres are not muscular, for they are compact and solid, but they readily break ; whereas, muscular fibres are soft, and bear extension, and are with difficulty broken. In several other respects, also, these fibres differ from the muscular and approach to the fibrous texture. The third, or *internal* coat, is remarkable for its extreme delicacy, and is so exceedingly thin as to appear nearly transparent. It is of a very white colour, and its external surface has an unctuous feel. Externally it is connected slightly to the middle coat, though not by intermediate cellular membrane. Notwithstanding the tenuity of the coat, it is possessed of considerable strength longitudinally, but tears readily when force is applied in the circular direction.

The *vasa vasorum*, with which all arteries are supplied, are commonly derived from the adjoining trunks or branches. They first penetrate the cellular coat, upon which they are abundantly distributed, then send numerous ramifications to the surface throughout the substance of the middle coat, and finally terminate, there is reason to believe, upon the inner surface of the third coat. According to Bichat,* however, these vessels do not reach the internal coat; but, as this coat is evidently vascular, as may be distinctly seen after careful maceration, the supply of blood is probably derived from the vasa vasorum, and perhaps, also, from some other source.

Arteries are subject to inflammation, suppuration, ulceration and sphacelus. They are also liable to have their texture subverted by the formation of calcareous concretions, by uniform enlargement or dilatation of their different coats, or by rupture of the internal and middle coats, in which latter case the disease *properly* termed *aneurism* is produced.

The internal coat is more subject to inflammation than either the middle or external coat. This is evinced by the effusion of lymph, which is often poured out in large quantity upon the inner surface of an artery in consequence of inflammation of contiguous parts, from the application of ligatures, from wounds, from the pressure of tumours, and from many other similar causes. Sometimes the inflammation thus excited travels along the vessels as far as the heart, and proves fatal. Chronic inflammation of the arteries is frequently met with, and is very apt to follow or precede calcareous depositions. An appearance similar to that produced by inflammation is often presented upon the internal surface of arteries—a vivid redness or scarlet tinge. This is not, however, always the result of inflammatory action, for it is seldom accompanied by an effusion of lymph. Arteries, likewise, that have been exposed for a few days to the air in the dissecting room, invariably assume the same colour.

Although arteries resist for a long time the *ulcerative* action, they are liable eventually to be destroyed. So long, however, as they continue *sound*, the risk of ulceration is diminished; hence the process rarely takes place except in arteries that

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* General Anatomy, translated by Hayward, vol. i. p. 317.

have been tied by ligatures of an improper form or size, or have been compressed by blood, which has injected the cellular membrane around the vessel and destroyed its vasa vasorum, and thereby deprived it of its nourishment. Ossified arteries, also, as they are called, sometimes ulcerate and give rise either to hemorrhage or to aneurism. Extensive ill-conditioned ulcers, by penetrating deeply and laying waste the soft parts, may occasion fatal hemorrhage, by opening large arteries.

It is unusual for arteries to mortify and slough, and when the process does take place, it is seldom followed by hemorrhage; for during the progress of the mortification among the surrounding parts, the vessels become filled with coagula, to a considerable extent, which seal their extremities for a time and prevent hemorrhage: these coagula are afterwards absorbed, and the mouths of the vessels permanently closed, through the medium of adhesive inflammation.

But the most common disease of arterial trunks and branches is the deposition of *calcareous* matter. So common, indeed, is this condition of the arteries in the advanced periods of life, that the vessels of few old subjects are exempt from it. It is not peculiar, however, to old age, but has been occasionally met with even in the arteries of infants. The *outer* surface of the internal coat is the most frequent seat of the calcareous deposit. From this surface it extends gradually through the coat and projects into the area of the vessel, being for a time still covered with a fine pellicle or membrane. At last this membrane gives way, and the concretion is then brought in contact with the blood. It is seldom that we find an artery completely encrusted with this earthy matter, so as to form an entire rigid cylinder; the depositions, on the contrary, are scattered in irregular patches, varying in shape, number, and size, over the surface, and throughout the substance of the internal coat. Sometimes they are intermixed with a curdy, pultaceous, or steatomatous matter. It is this condition of an artery which generally lays the foundation of aneurism, as will hereafter be explained: from this cause, also, it often happens, that arteries are unable to bear the operation of the ligature, which, when applied, either produces rupture of the vessel or excites ulceration. There are several other diseases, moreover, that seem to result from this earthy degeneration of the arterial tubes.

Uniform dilatation of the arterial coats is not so unfrequent as some modern writers have imagined; and although distinct in many respects from aneurism, is often conjoined, or exists simultaneously with that disease. From aneurism, however, it differs chiefly in the circumstance of the vessel being enlarged throughout the circumference—whereas, in aneurism, the dilatation is commonly on one side. Besides this, a dilated artery seldom, if ever, contains a coagulum, which an aneurismatic artery always does. The larger arteries are most subject to dilatation; hence, the disease is very common in the aorta; also, where vessels divide, or where they form angles, dilatation is very apt to ensue. From this cause the arch of the aorta, the iliacs and carotids at their division are oftentimes greatly expanded beyond the natural size. Very urgent symptoms, and even fatal consequences, not unfrequently follow an enlargement of the great vessels in the vicinity of the heart.

SECTION I.

ANEURISM.

Aneurism has been defined " a pulsating tumour formed of arterial blood;"* and to this there can be no valid objection, provided the explication be restricted to the form of the disease usually met with. Different appellations, also, have been given to certain varieties of the disease—such as true and false, circumscribed and diffused. Again—we have varicose aneurism, and aneurism by anastomosis. By the term *true* aneurism, is commonly understood a simple dilatation of all the coats of an artery—by *false* aneurism, a rupture or wound of the three coats, so that the blood is extravasated among the surrounding parts.

The terms *circumscribed* and *diffused*, relate merely to the form of the swelling or the extent of the extravasation. I shall deviate so far from common authority, as to restrict the meaning of *true* aneurism to that condition of an artery in which all its coats are uniformly dilated, or else the internal and middle coats ruptured while the cellular coat remains entire. By *false* aneurism, I understand that arising from a wound or division of an artery. *Varicose* aneurism, and aneurism by *anastomosis*, will be noticed hereafter.

In the incipient stage of aneurism, the tumour is small, free from pain, and easily made to disappear by pressure; but returns as soon as the pressure is discontinued. For a long time the skin preserves its natural colour; as the swelling augments, however, it becomes pale, and œdematous. The strength of the pulsation in the tumour, is greater during the early than the advanced stages of the disease; for in proportion as the swelling augments, the coagulated blood which fills the sac is interposed in such a way as to diminish the stroke of the artery in which the aneurism is seated. When the tumour attains a large bulk,

* C. Bell's Operative Surgery, vol. i. p. 70.

the integuments covering it become painful and livid, and crack
in different places; through the fissures a bloody serum is dis-
tilled, ulceration follows, which, extending to the sac, opens a
communication with its cavity, from which fluid blood issues in
a stream, mixed with coagula; as the ulceration extends, the
opening enlarges, the hemorrhage becomes more and more fre-
quent, and, if not arrested, destroys the patient. Sometimes the
tumour, by pressing upon a contiguous bone, causes its removal;
this is effected through the medium of the absorbents: the bone,
however, is not rendered carious, nor does the formation of pus
accompany the process.

Disputes have arisen, at different periods, respecting the for-
mation of aneurism, or the mode in which the disease is pro-
duced—some contending that there is a uniform dilatation of
the three coats—others, that the internal and middle coats are
ruptured or ulcerated, and the tumour formed by a distension
of the external or cellular coat. Both opinions seem to be well
founded, and the error committed, as correctly remarked by
Hodgson, appears to have been, that the advocates for each doc-
trine took too limited a view of the subject. There can be no
question, however, I think, that the theory broached by Sen-
nertus, and supported with so much ingenuity by Scarpa, will
be found to afford the true explanation of the phenomena usually
met with in the generality of aneurismal tumours—that the
internal and middle coats are ruptured or destroyed, and that
the sac is formed by a dilatation of the external coat. In proof
of this being the true explanation, it will only be necessary to
state, that in most aneurisms the tumour will be found upon
dissection to occupy one side of the artery, whereas, if all the
coats were regularly dilated, it should embrace the whole cir-
cumference of the vessel. Again—if a careful separation of
the different coats be made, the external coat may be traced
throughout, while the internal and middle coats, at the place
where the entrance of the aneurismal sac communicates with
the artery, will be perceived to terminate by an abrupt or
fringed margin. On the other hand, there can be no doubt
whatever, that a regularly dilated artery, and such as is com-
monly considered an aneurismal artery, is sometimes met with,
independently of a rupture of the internal coats, that, in other
instances, these coats, after having expanded to a certain extent,

ulcerate or are ruptured and give rise to the common form of the disease—the latter being thus ingrafted, as it were, upon the former. It must not be supposed, however, from these observations, that every dilated artery can be considered an aneurismal artery, for there are many instances to the contrary. The arteries, for example, of the impregnated uterus, become greatly enlarged beyond their natural size; the collateral branches, also, after a main trunk is tied, are dilated in a similar manner. The distinction, then, should be drawn between the dilatation of a sound and a diseased artery; and, perhaps, it may with propriety be stated, that *true* aneurism is never produced without a previous morbid condition of the coats of the vessel in which it is seated. This morbid change of structure has been already noticed, as connected with calcareous deposition, or with the formation of atheromatous matter between the internal or middle coats. Arteries thus situated are very liable to give way, even under ordinary muscular exertion; hence, in nine cases out of ten, external aneurism is the result of sudden and violent extension or flexion of a limb, while the internal is produced by lifting heavy weights, &c.

False aneurism differs essentially from the true, inasmuch as the blood is not contained within the entire walls of the artery, or within its cellular coat, but poured into the cellular membrane adjoining the wounded vessels, where it is either confined within a narrow space, or else spread over an extensive surface —hence the origin of the terms *circumscribed* and *diffused* aneurism. When a considerable artery is cut across, or punctured, and the blood does not find a ready outlet by the external wound, it flows internally, and may inject the cellular membrane of a whole limb, and so separate the vessels from their surrounding connexions, as to cause them afterwards to ulcerate upon the application of a ligature, and the patient to perish from secondary hemorrhage; or gangrene may ensue from the general pressure occasioned by the extravasation. If a *moderate* quantity of blood be effused, it seldom passes far beyond the boundaries of the wounded vessel, where it forms a coagulum which gives a temporary restraint to the hemorrhage; in the mean time, the external wound heals, and the loose cellular membrane around the coagulum also closes up and forms a sac, which

invests the clotted mass. A tumour is thus formed on the sides of the wounded vessel, the cavity of which communicates with that of the artery, constantly receives small portions of fresh blood, and at last comes to resemble the most common variety of the true aneurism, differing from it only in this—that the sac is formed not by the dilated external coat of the artery, but by the loose cellular membrane exterior to that coat.

TREATMENT OF ANEURISM.

Spontaneous cures of aneurism, although reported by writers, must be considered extremely rare. Such an event may be brought about by two or three different causes—by the formation of a large and firm coagulum, which fills not only the entire sac, but, perhaps, a part of the artery above it—from the tumour, by change of position, pressing upon and obliterating the superior or inferior portion of the artery—by inflammation and sphacelation of the sac and whole tumour. The first is the most frequent, the second seldom met with, and the third, when it does occur, usually attended with distressing symptoms, and sometimes followed by fatal consequences. A fourth mode by which a spontaneous cure may be effected, has been noticed by some writers —the stoppage of the caliber of that part of the artery, immediately below the tumour, by the accidental separation of a fragment of coagulated mass lining the cavity of the sac. It appears to me, however, that this conclusion is gratuitous, or at least not altogether supported by well attested facts.

Much may be done towards mitigating the symptoms of aneurism, and arresting the progress of the disease—by frequent and repeated blood-letting, by rigid abstinence, by confinement to bed or to the horizontal position, by the internal use of digitalis, and the external application of various astringents and refrigerants. Such remedies, cannot, however, be depended on in the generality of cases; although examples have been cited by Valsalva, Morgagni, and other old writers, and more recently by Pelletan, of perfect cures having been effected under various circumstances by the foregoing means. On this account, the practice should always be pursued whenever the tumour is so large and so situated as to render the operation by the ligature

impracticable; but success cannot be calculated upon, unless the depleting system be carried to the utmost extremity.

There are two modes, in the shape of an operation, practised for the cure of aneurism—*compression* and the *ligature.* Compression is now seldom resorted to—experience having proved its general inefficacy. The process has been found, moreover, even when successful, so extremely painful and tedious, that few patients can be induced to submit to it, or to persevere sufficiently long to accomplish a cure. That it operates, partly, upon the principle of the ligature, when it does succeed, there can be no doubt—by compressing the sides of the vessel, causing the effusion of lymph, and finally, obliteration of the channel, so as to force the blood to abandon the sac, and pass off by the collateral branches. When applied to the sac itself, such an effect, owing to the interposition of the coagulated mass, can rarely, if ever, be produced. Different machines for compressing aneurismal arteries or tumours, may be found in most systems of surgery.

The *ligature,* then, may be considered as the only mode of operation upon which any great reliance can be placed in the treatment of aneurism ; and this, too, frequently fails. From the numerous and diversified experiments of Dr. Jones and others, it appears that a ligature, when applied to an artery with sufficient force, divides the internal and middle coats, leaving the external coat entire. The blood, arrested in its passage by the approximation of the sides of the vessel, soon coagulates and forms a plug extending as high as the first collateral branch. This serves as a temporary barrier, and takes off the force of the circulation from the ligature and the extremity of the artery. In the mean time, the divided edges of the artery pour out lymph, which is not only effused in the cavity of the vessel, but between its coats ; the irritation, also, excited by the ligature, gives rise to an accumulation of lymph on the outer surface of the artery. At last, the external coat, continually irritated by the ligature, sloughs, or ulcerates, and the ligature is detached, leaving the mouth and edges of the vessel filled and surrounded by a bed of lymph, into which vessels shoot, and, by uniting the sides of the artery, form a permanent closure. After a time, the coagulum is absorbed, and the channel of the artery as high as the first anastomosing branch, is obliterated and converted into a solid cord. Long

before this process is completed, however, the blood, forsaking the main route, passes through the collateral vessels, which vessels gradually enlarge in proportion to the force of the column driven into them, until at last they equal or exceed in the aggregate the size of the original trunk, and the circulation becomes fully re-established.

But instead of a cure being always accomplished in this desirable manner, it sometimes happens that *secondary hemorrhage* results, and the patient either dies or is with difficulty saved. Such an event may be referred to several different causes—to the improper form, mode of application, and premature removal of the ligature—to a morbid condition of the aneurismal artery—to a deficiency of coagulum within the caliber of the vessel—to an unnecessary denudation of the coats of the artery, and perhaps to some other causes.

If a ligature, instead of being round and small, is flat and large, and twisted, or irregular in shape, it is not well calculated to divide the internal coats, or it does not divide them throughout their circle. Upon the same principle, if a large portion of the surrounding cellular membrane, or a contiguous nerve, be included in a ligature, the coats are partially divided or not divided at all. Again—even if the ligature be of a proper form and well applied, if, through the officiousness of the surgeon, it is pulled away before the adhesive process is perfectly accomplished, and lastly, if from an ill-formed knot, the ligature be forced by the impetus of the circulation from the mouth of the artery, hemorrhage results. In most of these instances, the coats of the artery inflame from irritation, or the vasa vasorum being compressed or destroyed, the vessel is deprived of its nourishment, and ulcerates or sloughs, either at its mouth or above the ligature. An artery is sometimes, in *false* aneurism, so separated from its surrounding connexions by extravasated blood, as to be completely insulated. Under such circumstances, it is soon, for want of support, reduced to a diseased state, and ulcerates if a ligature be applied to it. In cases of *true* aneurism, an artery is often ossified, or at least covered, at the place it is tied, with calcareous depositions. Such an artery is extremely prone to ulceration, and there is nothing better calculated to excite it than the irritation of a ligature. Although it has been stated that a coagulum is formed after the application of a ligature, it must

be understood that under *particular* circumstances, this does not happen—as, for example, in cases where a vessel is tied *immediately below* a large anastomosing branch. There is no opportunity, in such a case, for coagulum to form ; consequently, the ligature and the new-formed tender lymph along the extremity of the artery, sustain the whole force of the circulation; hence, it sometimes happens, after the ligature is detached, that the lymph, unable to resist the current of blood, gives way and hemorrhage ensues. With respect to the " unnecessary denudation" of the vessel, it may be remarked, that the surgeon, from ignorance or want of dexterity, may mangle the parts adjoining the artery, and cut off all communication between them, so as to render the vessel unfit, afterwards, to bear the ligature.

It must not be supposed, however, that ulceration or sloughing, and secondary hemorrhage, will *necessarily* result from these causes; nor should it be inferred, that an artery cannot be permanently closed, unless the *internal* coats be divided by the ligature, nor that an ossified, or denuded, artery will *never* heal. Experience proves the contrary; but it also proves that the failure of the operation, in most cases, is owing to the circumstances pointed out.

Previous to the time of the celebrated Hunter, the practice of tying the vessel immediately above the tumour, and afterwards opening the sac and clearing it of the coagulated blood, was universal ; but the operation so frequently failed, and the death of the patient so often followed, that this great pathologist was induced to investigate the subject in a particular manner. He found that the artery, immediately adjoining the tumour, was commonly in a diseased state, and therefore unable to bear the ligature ; that the practice of opening the sac and removing its contents, excited a great deal of constitutional irritation, accompanied by sloughing of the tumour and of the contiguous parts ; and that from these causes many patients lost their lives. Mr. Hunter at once conceived the ingenious idea of tying the artery at a *distance* from the sac, and of leaving the latter untouched ; the result was highly satisfactory, and proved most decidedly the value of his theory—that the artery should be tied in a *sound* part, and the sac and its contents removed by the absorbents. During Mr. Hunter's time, the operation was confined, almost exclusively to popliteal aneurism ; it has been extended by many

surgeons of the present day to every other aneurismal tumour
upon which an operation is admissible. An objection, however,
has been made to the Hunterian operation, which seems not
altogether destitute of foundation—the occasional return of the
blood into the sac through those anastomosing vessels, which
happen to communicate with the main trunk, somewhere inter-
mediate to the sac and the place where the ligature is applied.
But this so seldom occurs, that it can scarcely be considered,
except in particular situations, an objection.

In performing the operation for aneurism, in general, it is only
necessary for the surgeon to remember that he is to cut for a
sound part of the artery, at a greater or less distance above the
sac ; that he is to penetrate cautiously with the knife,—not ex-
tending the incision an immoderate length, and tearing the sur-
rounding parts by his fingers or by instruments,—until he ob-
serves the pulsation of the vessel, when he should endeavour to
detach it only to such extent from its connexions, as to enable
him to pass a common aneurismal or crooked needle, armed
with a small round ligature, beneath it. The ligature should
then be firmly tied, and one end being cut off near the knot,
the other should be left hanging from the wound, the edges of
which must be closed by adhesive straps.

Many surgeons follow the practice of Mr. Abernethy, and
apply two ligatures—afterwards dividing the artery between
them. I am disposed to think, that few, if any, advantages are
generally gained by this proceeding, and that in certain cases it
will be attended with imminent peril.

Brasdor, and afterwards Desault, conceived that under par-
ticular circumstances—where the tumour, for instance, is so
large or so situated that the artery cannot be tied *above* it—a
ligature applied to the vessel *beyond* the tumour might effect a
cure, by causing the blood to coagulate in the sac and upper
part of the artery, as high as the first anastomosing branch. The
experiment was tried by Deschamps and by Sir Astley Cooper
—but without success, owing to one or more anastomosing
vessels passing off between the sac and ligature, in such a way
as to keep up a constant stream of blood through the sac. At the
Philadelphia Hospital, during the winter of 1827, in a case of
femoral aneurism extending a considerable distance above Pou-
part's ligament, in a patient nearly seventy years of age, in pre-

sence of Professor Mussey, of New Hampshire, now of Cincinnati, and several other medical gentlemen, I cut down upon the femoral artery immediately below the tumour, and compressed the vessel for some time between two fingers, with a view of ascertaining whether the pulsation in the tumour could be diminished,—intending in that event to apply a ligature. So far, however, from any favourable change being produced by the compression, the pulsation continued without interruption, so as plainly to indicate that anastomosing vessels passed off between the ligature and sac. Under these circumstances, and particularly as the patient had long laboured under an obstinate cough, and some apparent disease of the great vessels within the chest, I resolved not to apply the ligature, but to bring the edges of the wound together, and suffer it to close, which it did, though not without difficulty, in two or three weeks. This patient died during the autumn of 1829, and, upon examination, it was found that four vessels, each nearly as large as the femoral artery, passed off from the lower part of the sac. The iliac and femoral arteries, as well as the sac and smaller vessels, were covered with calcareous incrustations. If the artery had been tied, it would, in all probability, have taken on ulceration, and, at any rate, the operation could not have been productive of any benefit.

That the operation of Brasdor, has, however, succeeded in a few instances, there is every reason to believe. Mr. Wardrop,* of London, who, within the last few years, has turned his attention particularly to the subject, and who deserves great credit for the persevering efforts he has made to establish the operation, has published the result of four or five cases, in some of which the termination is said to have been successful.

Mr. Wardrop has extended, likewise, the operation of Brasdor, to aneurism of the *arteria innominata*—by tying the subclavian or carotid arteries. He has reported the successful termination of a case of the kind, in which the subclavian was taken up by himself, and another by Mr. Evans, who tied the carotid artery for aneurism of the innominata, and succeeded perfectly. Within the last few years Dr. Mott, of New York, performed a similar operation, but the patient did not recover. Mr. Lambert's case, also, terminated in the same way.

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* Wardrop on Aneurism, London, 1828.

Other cases have been reported since,—making in all about eighteen or twenty,—in which the operation has been performed, but without permanent benefit, except in a very few instances; from all which it may be inferred, that Brasdor's operation is, in every respect, a very dangerous and uncertain one—that it is liable to be followed by high inflammation, ulceration and sloughing, from the artery being tied—almost necessarily—in a diseased part, and by secondary hemorrhage—that it can seldom succeed when collateral vessels pass off from the sac—that it ought never to be performed, unless other operations are impracticable, and the patient's life in immediate danger; and that, when performed, it should always be conjoined, if possible, with medical and other means.

Whatever mode may be selected for the operation of aneurism, there is one point upon which most surgeons entertain the same opinion—that little danger is to be apprehended of *gangrene*, from want of collateral branches, or free distribution of blood, except amongst arteries of the largest class.

SECTION II.

ANEURISM OF THE AORTA.

THERE is no artery more subject to aneurism than the aorta; and, unfortunately, the disease, when thus situated, is seldom, if ever, cured. Owing to the rapidity with which the blood issues from the heart, and its forcible propulsion against the arch of the aorta, where it first meets with resistance, this portion of the vessel is particularly apt to suffer, and here the aneurism will be found, usually, to commence either in the form of a general dilatation of the coats, or, as is most frequent, by rupture of the internal and middle coat, with distension of the cellular; in which last case the tumour will be situated on each side of the artery—as explained in some of the preceding pages.

The *symptoms* of aneurism of the thoracic aorta are more or less difficulty of breathing, a sense of uneasiness and constriction about the chest, palpitation of the heart, severe pain, shooting from the sternum towards the arms,—compared by some patients to that produced by a rope drawn tightly around the chest,—a troublesome, hacking cough, difficulty of deglutition, feeble and intermitting pulse. In the advanced stages of the disease, or in proportion as the tumour acquires bulk, all these symptoms are aggravated, and others often superadded, such as tremendous pulsation in the tumour and large vessels adjacent to it, or about the heart. Frequently it happens, that a part of the swelling rises above the sternum, in which case the disease is liable to be mistaken for aneurism of the innominata, carotid, or subclavian arteries. When the tumour attains a great magnitude, its pressure upon the sternum, ribs, or clavicles, causes their absorption; every barrier is then removed except the integuments; and the tumour, whose dimensions are sometimes enormous, projects beyond the chest. At last, the integuments, the sac, and its immediate coverings inflame and ulcerate, and masses of coagulated blood are discharged. Pressure for a time, perhaps,

arrests their progress, but the ulcerated opening continues to enlarge, and finally the patient, oftentimes without a moment's warning, is destroyed by hemorrhage. In many instances, however, and long before the aneurism acquires any considerable bulk, it bursts into the chest, into the cells of the lungs, or into the pericardium, and instantaneously proves fatal. In some rare instances, communications have been established between the aneurismal sac and the pulmonary artery, or the œsophagus, or trachea, and, of course, with a fatal result.

There are several diseases about the chest, whose symptoms bear a similitude to those of aneurism of the aorta; such as enlargement of the bronchial glands, collections of serum or pus, which by pressure on the heart force it towards the right side of the chest, where it may be felt pulsating strongly, morbid thickening of the parietes of the heart, &c. On the other hand, aneurism of the thoracic aorta, from its pressure on the lungs, will sometimes give rise to symptoms resembling those of phthisis pulmonalis. For these reasons, the surgeon should be very cautious not to pronounce, too hastily, a prognosis.

The *abdominal* aorta is often the seat of aneurism. Generally, the tumour is situated immediately below the diaphragm, and owing to the little resistance it meets with from the loose and yielding textures surrounding it, soon acquires considerable bulk, and pulsates most awfully, and so distinctly and forcibly, as in some instances to elevate the bed-clothes, of which the patient and bystanders are very sensible. When the tumour becomes very large, there is not only dropsy of the belly and limbs, from pressure on the thoracic duct, but destruction of the lumbar vertebræ, followed by paralysis of the legs, and eventually by the death of the patient; which, for the most part, is occasioned by a rupture of the sac,—the blood being poured into the duodenum, stomach, or cavity of the belly.

TREATMENT OF ANEURISM OF THE AORTA.

Although Sir Astley Cooper, James, and Murray have been adventurous enough to tie the abdominal aorta, in cases of aneurism of that vessel, I trust that there are in this country but few surgeons, if any, disposed to follow their example; for,

certainly, there is reason to believe, that, independently of the
great irritation which must necessarily follow such an operation,
gangrene would, in every instance, be the result,—from the
want of an *adequate* supply of blood.   This observation is made
with a perfect knowledge of the fact, as stated by Scarpa,
Hodgson, and others, " that if the aorta be tied in the dead sub-
ject, immediately below its arch, and a thin injection thrown
into the upper portion of the vessel, it will pass into the arteries
of the lower extremities."

All that we can hope to accomplish, then, in most cases, is to
arrest the progress of the disease, or save the patient's life for
a time.   This may undoubtedly be done by strict abstinence,
repeated blood-letting, the internal use of digitalis, the external
application of astringents and cold, and, in the advanced stages,
by supporting the tumour with leaden compresses, adhesive
straps, &c.   Some instances, indeed, of *perfect* cures having
been accomplished by these means, are related, and upon most
respectable authority.   Few patients, however, can be brought
to submit, for any length of time, to so rigid a system as the
advocates of this practice have enjoined.

SECTION III.

ANEURISM OF THE CAROTID.

CAROTID aneurism, whether from a wound or from disease in the coats of the vessel, may be considered comparatively rare. It is met with chiefly in hard-working people, especially those accustomed to carry heavy burdens upon their heads and shoulders. The tumour may occupy either the common trunk, or the internal or external carotid. Generally, it is situated near the angle of the jaw, at the place where the artery divides. Like aneurism in most other situations, it may be known by its strong pulsatory motion, by its rapid enlargement, by the cough and difficulty of respiration, and of deglutition, occasioned by pressure of the tumour upon the larynx and œsophagus. It is sometimes, however, extremely difficult to distinguish between this disease and other tumours about the neck, and in the immediate vicinity of the artery. Common glandular or sarcomatous tumours, for example, if they happen to lie in contact with the carotid, have a pulsation communicated to them. In such cases, if the tumour can be elevated, or removed from the vessel by the fingers, the pulsation will cease, and the true nature of the disease become manifest. Again—if pressure be made upon an ordinary tumour, or upon the carotid running near it, the tumour is not diminished, whilst aneurism, treated in a similar manner, is sensibly decreased. Several cases are recorded of aneurisms of the aorta having ascended so high upon the neck, as to be mistaken for carotid aneurism.

TREATMENT OF CAROTID ANEURISM.

The fact that the carotid of one or both sides, might be obliterated by disease, without curtailing the supply of blood destined for the brain, has been long known. Several instances,

too, are mentioned by the older writers of wounds of the carotid terminating favourably, after the application of the ligature; but Sir Astley Cooper was the first, I believe, to tie this vessel in a case of aneurism; though the propriety of such a measure had been strenuously insisted upon by Mr. John Bell, as the following passage,—referring to the case of a woman who had been suffered to perish for want of an operation,—will evince. " Nothing could more tempt us to a daring experiment, than the desperate condition of such a patient, nor is there any thing in the relative situation of these parts to deter us; had this woman been under my care, or should ever such a case recur, I should never hesitate one moment, conscious that the most absolute bungler in surgery, might lay aside the muscle with a few strokes of his scalpel, open the common sheath of the carotid and its accompanying nerve, and separate the vein, nerve, and artery, so as to tie the latter without let or hinderance."*

Since Sir Astley Cooper's operation, which was first performed in 1805, the experiment has been very frequently repeated, and has now become an established practice. To perform the operation to advantage, the patient should be placed in the recumbent position, with his head somewhat raised by a pillow, and slightly inclined towards the affected side. The surgeon then makes an incision two or three inches long on the inner edge of the mastoid muscle, commencing immediately below the tumour. An assistant pulls to one side the mastoid and sterno-hyoid muscles. This will bring into view the internal jugular vein, the omo-hyoideus muscle, and sometimes the decendens noni, all of which should be avoided. The next step of the operation is to expose and open the sheath of the artery, which is easily done by pinching up the sheath with a pair of dissecting forceps, and making a horizontal cut into it. The sheath being opened, an aneurismal needle or flexible silver probe, armed with a ligature, is passed around the artery; taking especial care before tying the ligature, to exclude the par vagum. Having tied the artery fairly, and secured the ligature by two or three knots, its ends are left hanging from the wound; the lips of which should be closed by adhesive

* Principles of Surgery, vol. iii. p. 254.

straps.   A single ligature, in case of carotid aneurism, should always be employed: for if two ligatures be applied, and the artery divided between them—as advised by Abernethy—the patient would inevitably perish by hemorrhage, if, from any cause, the ligature should be detached.

The operation of tying the carotid has now become so common, all over the world, as to render it impossible, perhaps, to designate the operators.   In this country, it has been tied nineteen times by Dr. Mott alone, and in two instances, on both sides—in one of which last it proved successful.   My friend, Professor Mussey, of Cincinnati, has also tied the carotid on both sides, after an interval of twelve days between the first and second operation, and with equal success.   The tying of this vessel, however, for the removal of tumours has not proved so successful as in cases of aneurism—having been found to fail in numerous instances. But my friend, Dr. A. E. Hosack, of New York, recently accomplished a cure of a large tumour, involving the parotid, which I saw with him last summer, by taking up the carotid—after an attempt, by another surgeon, to extirpate the tumour, had failed.

AXILLARY ANEURISM.

Aneurism of the axillary artery is sometimes met with. It may arise either from a morbid condition of the coats of the vessel, or from a wound. In whatever manner produced, the tumour enlarges with great rapidity, soon fills the armpit, and, not unfrequently, extends above the clavicle. The characters of the disease are so well marked, as to be seldom mistaken; yet instances are related of such tumours being opened by ignorant surgeons, under the impression that they were abscesses.

TREATMENT OF AXILLARY ANEURISM.

If the aneurism be small, and seated low in the axilla, which seldom happens, the surgeon may possibly find sufficient space between the sac and the clavicle, to enable him to include the axillary artery in a ligature; on the contrary, should the tumour be large, and occupy the commencement of the vessel, it will be necessary to tie the *subclavian* artery. The two operations differ materially from each other, on which account it will be necessary to describe them separately.

To tie the *axillary* artery, the surgeon should make an incision,—the patient being seated in a chair with his shoulders thrown a little backwards, and supported by an assistant,—two or three inches in length, commencing near the external extremity of the clavicle—running downwards in a semilunar direction and terminating near the edge of the deltoid muscle. Following the course of the external incision, the fibres of the pectoralis major should be next divided, until the pectoralis minor is exposed. Between the clavicle and the superior edge of this last muscle, the axillary artery will be found. Here the vessel is

encompassed by the axillary vein, and by a plexus of nerves. The surgeon must, therefore, proceed very cautiously, lest he divide some of these parts with the knife, or include them in the ligature. The vessel being fairly exposed, and separated to such an extent, as barely to permit the aneurismal needle, with its ligature, to pass beneath it, should be tied, when the pulsation in the tumour and at the wrist will immediately cease.

When it is necessary to take up the subclavian artery, (the operation commonly practised for axillary aneurism) the position of the patient will be found a matter of immense importance. He is seated on a low stool or bed, with his head thrown backwards, and inclined towards the sound side, and the posture steadily maintained by an assistant. Another assistant keeps the arm close to the chest, and at the same time pushes the shoulder downwards and forwards as low as possible. The surgeon makes an incision through the skin above the clavicle, commencing near the sternal extremity of that bone, and terminating at the anterior edge of the trapezius muscle. The fibres of the platysma myoides, and cervical fascia, are next carefully divided, until the external jugular vein is exposed. An assistant holds aside this vessel with a curved spatula or blunt hook, while the operator separates, with the *handle* of the knife, the loose cellular membrane, until he reaches the acromial edge of the anterior scalenus muscle. Near the origin of this muscle, from the first rib, the artery will be found. Owing, however, to the great depth of the vessel, it cannot be easily reached,—if the tumour is large—by the common aneurismal needle; on this account, particular instruments have been invented by Deschamps, Bellocque, Desault, Ramsden, Watt, Crampton, and others. I prefer that of Bellocque, and the common artery forceps of Dr. Physick,* to most of them. Bellocque's instrument consists of a silver cannula, six inches long, straight at the upper extremity, and slightly curved at the lower, containing within its cavity a watch-spring, which, by means of a silver stilet attached to it, may be pushed forward or retracted at pleasure. The lower extremity of the spring is covered by a small silver bulb, which not only serves to render the end of the cannula obtuse, but, from being perforated, to convey the ligature. A ring at

* See vol. i. p. 64.
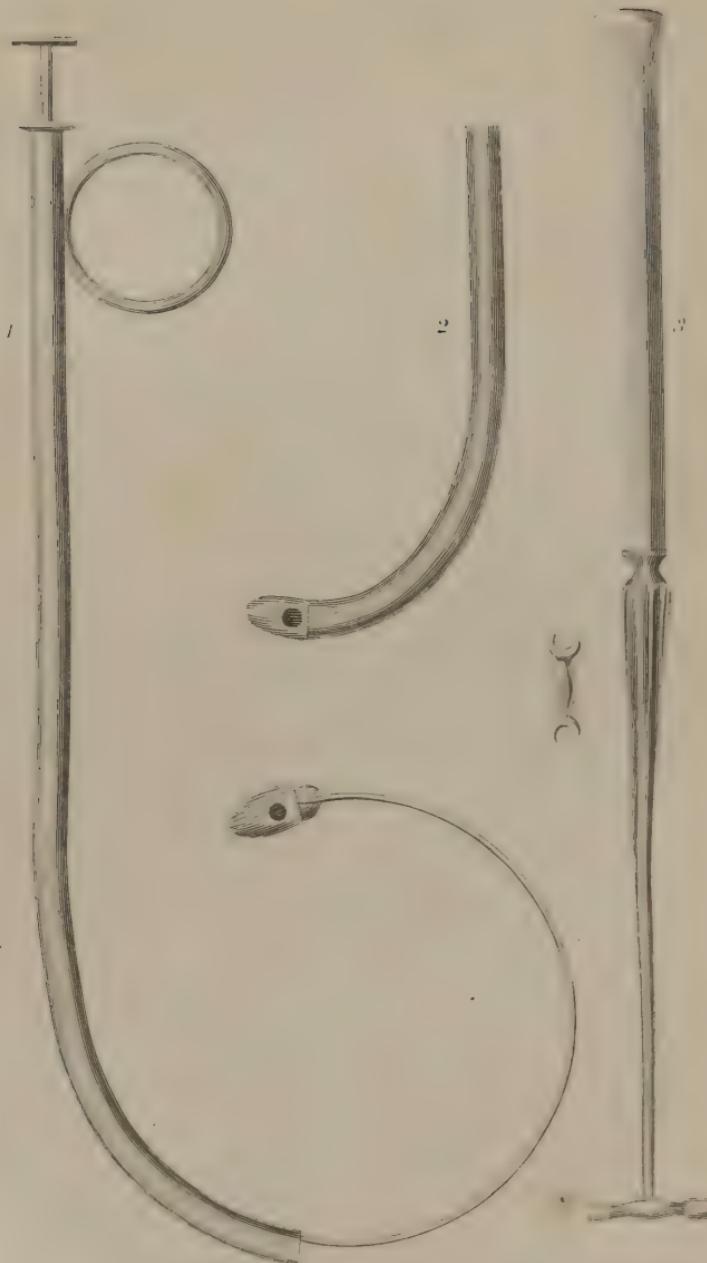
Plate IX. V.2.

the superior portion of the cannula, enables the surgeon to hold the instrument steadily. *Two different views of this instrument may be seen in Plate IX. figs.* 1 and 2. Having laid bare the subclavian, the surgeon will experience no difficulty—unless it be made too large—in passing beneath it this instrument, with the spring retracted, which being done, it only remains to push forward the stilet, when the spring ascends from the bottom of the wound, and a ligature being passed through the eye of the silver bulb, the whole instrument is withdrawn, carrying along with it the ligature and depositing it beneath the vessel.

An instrument, however, differing in principle from every other, which I have used upon several occasions, and which I published the following account of in 1828, is calculated, I think, to do away all the difficulties that surgeons have so long complained of. "Having experienced much more trouble than I expected in passing the ligature beneath the subclavian, I called soon after the operation, upon Mr. Schively, one of the most experienced cutlers in the United States, and requested him to make for me an instrument of the shape and size of the common aneurismal needle, calculated to hold a steel stilet capable of being passed, without difficulty, beneath deep-seated vessels. His ingenuity soon removed the defects usually complained of, and produced an instrument, which I do not hesitate to say, in point of simplicity and usefulness, is as yet unrivalled. It consists of a silver cannula, fixed in a wooden handle surrounded (near the part where the cannula joins the handle,) with a silver collar, through which a steel stilet, made of a narrow watch-spring, the length of the instrument, passes, and immediately after enters an opening just below the collar, in order to traverse the whole cavity of the cannula and emerge at its point. This extremity of the stilet is covered with a flattened silver cap moderately blunt, whilst its other or *upper* extremity passing upwards from the collar above mentioned, lays parallel with the handle, and has an *eye* near its end for holding a ligature. A small screw, for the purpose of fixing the stilet while the surgeon is in the act of passing the instrument beneath the artery, works through the silver collar, and may be used or not as the surgeon pleases. It will be seen at once, that the great advantage which this instrument possesses over those in common use, is that the ligature being held by the *upper* instead of the lower end of the stilet,

the surgeon can draw the stilet along with the ligature, at once, through the cannula and under the vessel—whereas, in other instruments, the ligature being passed through the *lower* end of the stilet, must, after having been carried beneath the artery, be in part retracted again before the surgeon can tie it."* An additional stilet, if necessary, with a *sharp* point, may accompany the instrument. The use of the instrument, however, as well as its form and size, will be better understood by the drawing in Plate X. figs. 1 and 2. The instrument *appears* unnecessarily large and clumsy. It requires, however, to be substantial. Upon showing it, indeed, to Sir Astley Cooper, in London, two years ago, he remarked that "he liked it, on account of its strength, as well as the principle upon which it was formed, and that if he had been in possession of such an instrument, at the time he operated on the axillary aneurism so large as to prevent him from encompassing it by any of the ordinary contrivances, he should have succeeded in tying the subclavian, instead of being foiled and obliged to abandon the operation." Mr. Weiss, the celebrated cutler, was, also, so well satisfied of the superiority of the instrument over most others he had seen, as to manufacture it.

It may sometimes be found, owing to the great depth of the wound, very difficult to close completely the knot of the ligature. In that case I would employ the ingenious contrivance of Dr. Alexander Hosack, of New York, which, by holding the first knot firm, enables the surgeon to tie a second or third with the utmost facility. This instrument is so simple and so easily understood, as to render a description of it superfluous. (See Plate IX. fig. 3.)

Both the axillary and subclavian arteries have been repeatedly tied in axillary aneurism, and, at first, with very little success. This may, perhaps, be ascribed to the operation having been generally delayed too long, or to the same disposition to disease in the vessel which gave rise to the aneurism. The operation, however, proved, satisfactorily, that there was no want of collateral branches, and consequently seldom danger of gangrene from deficiency of blood. That much more success has attended the efforts of surgeons of late years, is proved by statements re-

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* See Gibson's Case of Axillary Aneurism, in Philadelphia Journal of Medical Sciences for 1828; and vol. i. of this work, p. 362.

Plate X Vol 2
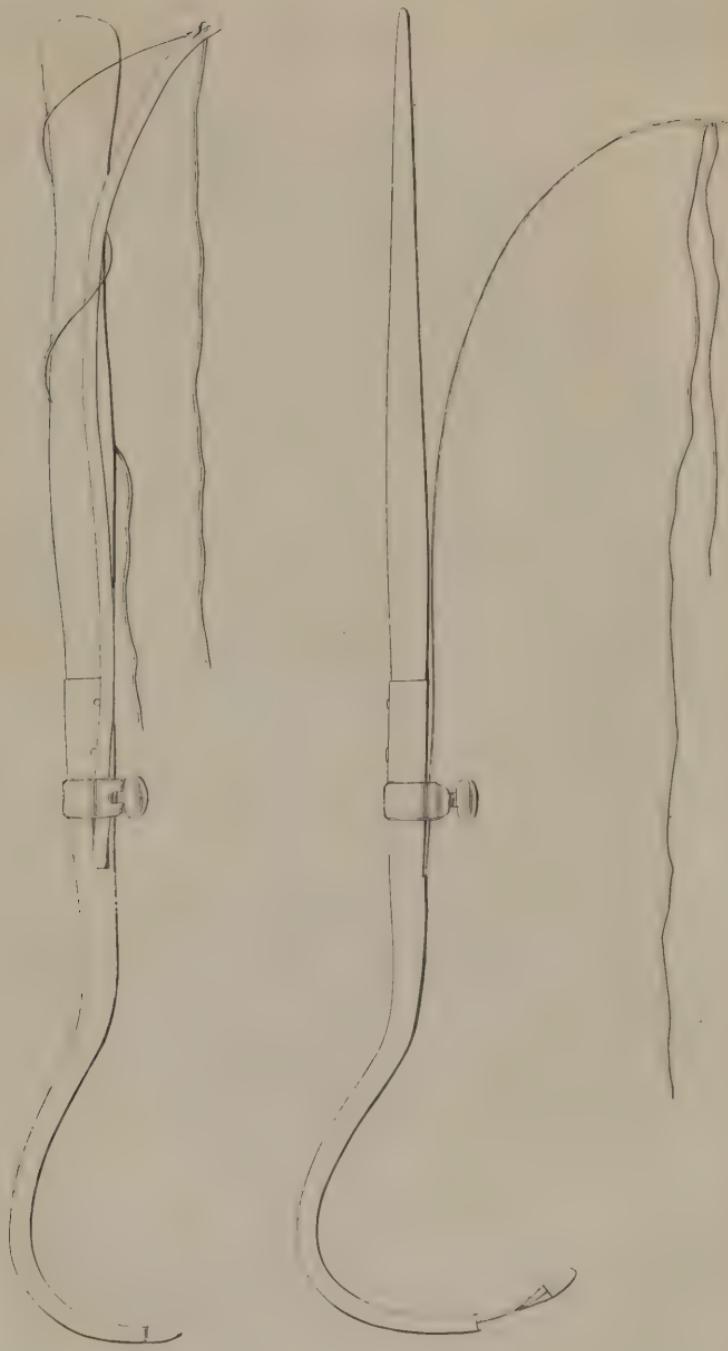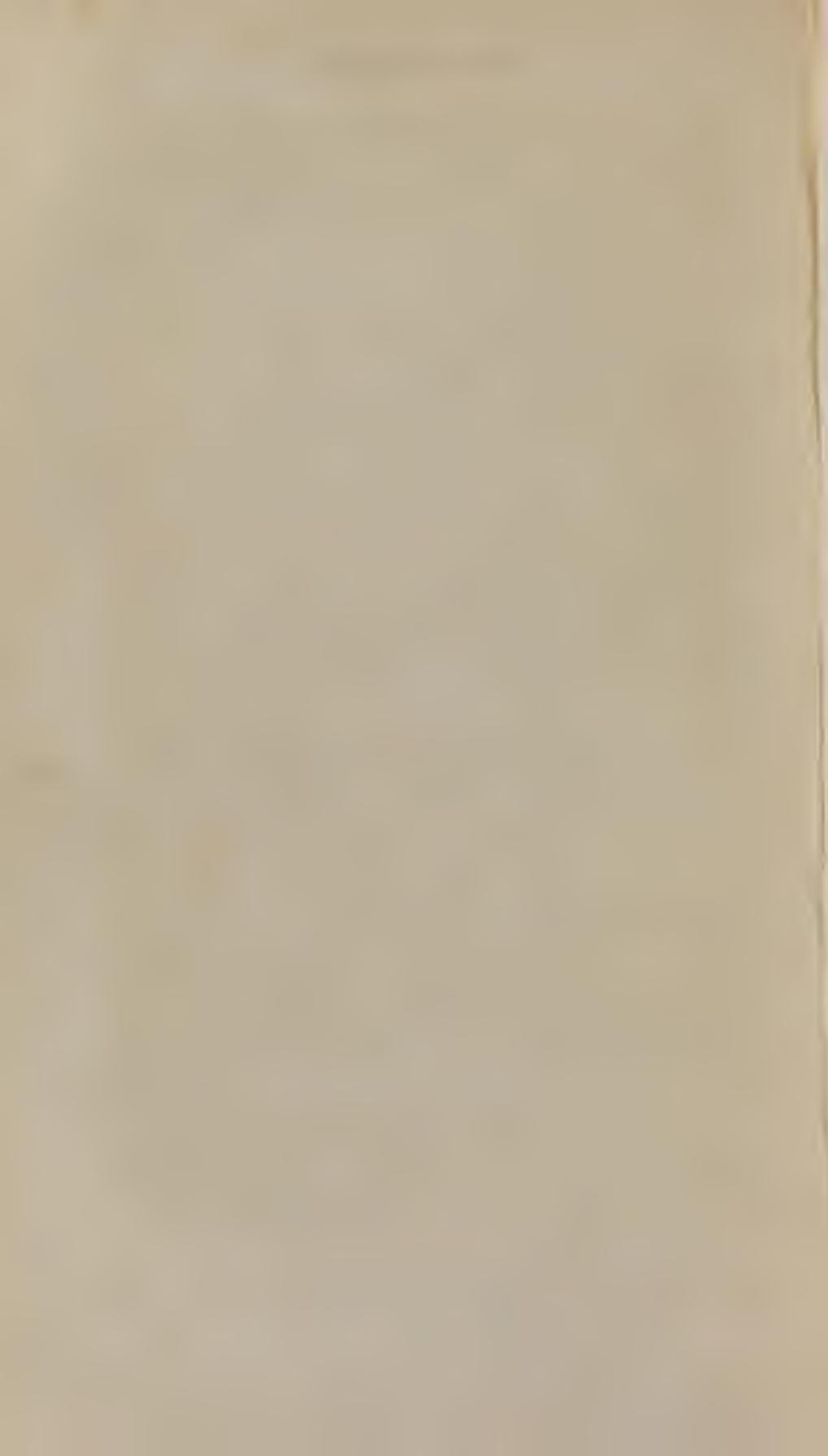
cently made, in a very interesting paper on axillary aneurism, by Professor Gross, of Louisville, Kentucky;* from which it appears, that out of twenty-six patients, seventeen, or nearly two-thirds, were *cured.* This account does not, of course, include all the cases operated on in different parts of the world, or even in this country; for Dr. Mott has four times taken up the subclavian, once within the scaleni muscles on the right side, without success, and three times on the outside, successfully,—all for aneurism. Other American surgeons, too, have frequently performed the operation. Among these I may mention Dr. I. T. Pitney, of Auburn, New York, who, in September, 1840, tied the subclavian and cured his patient; although the ligature did not come away until the eighty-first day. The honour of having first tied *successfully* the subclavian artery, is due to an American surgeon—the late Professor Post, of New York.

Deligation of the *arteria innominata*, in certain cases of axillary and subclavian aneurism, had been suggested by different surgeons; and our friend, Dr. Mott, of New York, was bold enough, a few years back, to try the experiment—but without success. Similar operations have since been performed by Græff, of Berlin, Hall, of Baltimore, Lizars, of Edinburgh, and recently at Paris, and with similar results. I have no disposition to condemn these attempts, because every effort towards saving the life of a fellow-creature, should be deemed praiseworthy; but I cannot help thinking that the chance of success must necessarily—owing to the great size of the innominata, its contiguity to the heart, and the probably diseased condition of its coats—be so very limited, in most cases, as not to justify the practice. Another objection, that might be urged against tying the innominata is this—that subclavian and axillary aneurisms have sometimes been cured *spontaneously.* A ligature upon the carotid or subclavian, I should conceive the proper plan in all cases of the kind.

* Case of Axillary Aneurism, for which the Subclavian Artery was tied; with an Inquiry into the Nature and History of that Affection: by S. D. Gross, M. D. Prof. of Surgery in Louisville Medical Institute.

SECTION V.

BRACHIAL ANEURISM.

It is remarked by Hodgson, that he has "never seen an aneurism in the arm which was not produced by accidental violence."* The experience of other surgeons confirms the statement, and proves a diseased condition of the coats of this vessel to be a very rare occurrence. "Disease in the coats of the arteries of the upper extremity, to a great extent," says Liston, "is not common, and very few cases of true aneurism lower than the axilla are either met with in practice, or mentioned in surgical works. I have treated but one such case; it occurred in the person of an old ship-carpenter. Whilst at work, as usual, he felt something snap in his arm; a pulsating tumour was soon afterwards noticed, and had attained, during four months, fully the size of a hen's egg, and was evidently, in part, composed of solid matter. The brachial was tied, and every thing went on favourably."† Pelletan has recorded a similar instance. The most frequent cause of the aneurism, is a wound of the artery at the bend of the arm from the common operation of blood-letting. The external wound having healed, the blood is gradually diffused in the cellular membrane around the artery, and beneath the fascia; a tumour is thus formed, which, in proportion as it augments, causes the fingers and forearm to contract,—owing to the unyielding nature of the fascia, or the firm aponeurotic expansion of the biceps— the limb to diminish, and the patient to experience very considerable numbness and pain.

TREATMENT OF BRACHIAL ANEURISM.

Surgeons are unaccustomed, now, except under particular circumstances, to lay open the aneurismal sac at the bend of the

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* Diseases of the Arteries and Veins, p. 389.
† Operative Surgery, p. 203.

arm, and evacuate the clotted blood ; experience having proved that the Hunterian operation is as well calculated to succeed here, as in other parts of the body. The aim, therefore, of the operator, in brachial aneurism, is to cut for the trunk of the artery at some distance above the sac.* The tourniquet being loosely applied, chiefly with a view to render the subcutaneous veins conspicuous, and to prevent the surgeon from wounding them, an incision should be made through the integuments, about two inches and a half in length, along the inner edge of the biceps muscle, and about the middle of the arm. The fascia being next divided, the cellular sheath, containing the artery, veins, and median nerve, will be brought into view ; and upon opening this, the artery may be readily found and tied ; without risk, if the surgeon is at all careful, of including nerves or other contiguous parts. It is proper to mention, however, that Dupuytren and others have sometimes experienced great diffi- culty in distinguishing the nerves from the vessels, and that gan- grene and paralysis have followed the tying of the former. A common aneurismal or curved needle introduced on the ulnar side of the artery, to avoid the median nerve, will be sufficient to convey the ligature : and this being tied, the wound is dressed in the ordinary way.

* A larger share of experience has taught me, that the Hunterian operation is not to be relied upon to the extent I have stated ; for I have found that when the artery is simply tied in one place above the tumour, that the pulsation will be apt to continue or return in the sac, through the medium of collateral branches. Dr. Physick has made the same observation ; and Dr. Hartshorne informs me that he was obliged, in one case, to cut down and tie the artery below the sac, before he could effect a cure. Upon the whole, then, I am inclined to believe that the safest, and least troublesome practice, will be to tie the vessels close above and below the sac, in the generality of cases.

SECTION VI.

INGUINAL ANEURISM.

When a true aneurism forms, at or near the bend of the groin, a small circumscribed pulsating tumour is perceived, which, from the femoral artery being closely surrounded by dense cellular membrane, and covered by the unyielding fascia of the thigh, increases very slowly, and sometimes so insensibly that neither the patient nor surgeon are aware of its nature, or, perhaps, mistake it for an enlarged inguinal gland, or a hernia. In time, however, these doubts are dispelled by the increase of the tumour, by the general swelling, numbness, coldness, and insensibility of the limb, and finally, if the disease is permitted to run its course, by the inflammation, and, perhaps, sphacela-tion of the sac, when the patient will either perish from hemor-rhage or from irritation, or else obtain, as has sometimes hap-pened, a spontaneous cure.

TREATMENT OF INGUINAL ANEURISM.

Although Guattani and Mr. John Bell had amply demon-strated the existence of very large and numerous inosculations, calculated, as they believed, to afford a full supply of blood to the thigh, in case the femoral artery should be obliterated, or tied, above the origin of the profunda, it remained for Mr. Abernethy to prove by an operation on the living subject, the correctness of their views. This distinguished surgeon, in a hopeless case of femoral aneurism, was induced, in 1796, to tie the *external iliac* artery, and though the patient did not recover, he lived long enough to evince the propriety of repeating the operation in subsequent cases. Mr. Abernethy's second attempt was alike unfortunate; but his third and fourth were crowned with complete success, and served to establish the operation,

which has since been repeatedly executed by different surgeons, and often with the happiest effect. In America, the operation was performed, for the first time, by the late Dr. Dorsey, in 1811, and with a result that usually followed the efforts of that accomplished surgeon. Dr. Mott has performed this operation five times, and thrice with success, and Dr. Warren, of Boston, four times—twice with success.

Mr. Abernethy's operation for inguinal aneurism, which I prefer to that of Sir Astley Cooper, or any other I am acquainted with, is executed in the following way. The patient being laid upon a table, an incision should be made in the course of the external iliac, commencing about an inch and a half from the anterior superior spinous process of the ilium, and extending within half an inch of Poupart's ligament. The tendons of the external oblique muscle being cut through to an extent corresponding to the wound in the integuments, a finger should be carried beneath the margins of the internal oblique, and transversalis, to prevent the peritoneum from being injured while the surgeon is dividing these last mentioned muscles. As soon as this stage of the dissection is completed, the finger can be readily passed behind the peritoneum as far as the inner edge of the psoas muscle, where the external iliac artery, and its corresponding vein will be found. The vein, running along the inner side of the artery, should be gently separated from that vessel by the finger-nail, or handle of the knife; a ligature may then be passed around the artery, by means of the aneurismal needle, and tied; and the wound being dressed, the patient must be put to bed, and the muscles of the limb kept in a relaxed position.

Gluteal aneurism is occasionally met with; and it was formerly the practice, in such cases, to lay open the sac, and secure the artery where it emerges from the pelvis. The late Mr. John Bell performed a terrific operation of the kind, upon a tumour of immense size, and succeeded, though with great difficulty, in curing his patient. His example was followed in a few other cases; but the high inflammation, suppuration, and caries of the innominatum and ischium that sometimes ensued, induced surgeons to seek for less formidable measures. To Dr. Stevens, the distinguished surgeon of Santa Cruz, the profession is greatly indebted for a more simple and effectual operation— namely, the application of a ligature to the *internal* iliac artery.

From experiments made upon the dead body, Dr. Stevens was induced to believe that the internal iliac might be taken up in the living subject, and a case of gluteal aneurism, nearly as large as a child's head, having presented itself to him in 1812, he determined to try the experiment. " An incision, above five inches in length, was made," says he, " on the left side, in the lower and lateral part of the abdomen, parallel with the epigastric artery, and nearly half an inch on the outer side of it. The skin, the superficial fascia, and the three thin abdominal muscles, were successively divided; the peritoneum was separated from its loose connexion with the iliacus internus and psoas magnus; it was then turned almost directly inwards, in a direction from the anterior superior spinous process of the ilium to the division of the common iliac artery. In the cavity which I had now made, I felt for the internal iliac, insinuated the point of my fore-finger behind it, and then pressed the artery between my finger and thumb. Dr. Lang now felt the aneurism behind; the pulsation had entirely ceased, and the tumour was disappearing. I examined the vessel in the pelvis; it was healthy, and free from its neighbouring connexions. I then passed a ligature behind the artery, and tied it about half an inch from its origin. The tumour disappeared almost immediately after the operation, and the wound healed kindly. About the end of the third week the ligature came away, and in six weeks the woman was perfectly well." Dr. Stevens informed me, during the winter of 1831, that he found no difficulty in avoiding the *ureter*, which retired along with the peritoneum when that membrane was raised from the tumour.

Mr. Atkinson, of York, in England, next tied the internal iliac artery for gluteal aneurism, in 1817, but the patient died on the nineteenth day after the operation. A Russian surgeon is said to have been the third person who tied this vessel; Mr. Thomas, of Barbadoes, the fourth; and the fifth operation of the kind was performed by Dr. S. P. White, of Hudson, New York State, in 1827. Dr. Mott also tied the internal iliac, in 1834. With the exception of Mr. Atkinson's, these patien s all recovered; and this fact is sufficient, consequently, to establish the operation.

The *common* iliac artery was *first* tied by myself so far back as the year 1812—in a case of a gun-shot wound. The patient

lived *thirteen* days after the operation, notwithstanding the un-
favourable circumstances of the case, and died, finally, from
peritoneal inflammation and secondary hemorrhage. He lived
sufficiently long, however, to prove satisfactorily to me, that the
largest artery in the body, (except the aorta,) might be tied
without cutting off permanently the supply of blood to the lower
extremity—for the circulation of the limb was re-established on
the seventh day—and to enable me to lay down the principle,
which I then did, that *aneurisms* of the *external* and *internal*
iliac arteries should be treated by tying the *iliaca communis.*
This I consider the more important, inasmuch as surgeons were
accustomed at that time to view such aneurisms as necessarily
fatal. It affords me great pleasure to add, that my friend, Dr.
Mott, of New York, acting upon the principle I had established,
has been able to demonstrate the practicability of my proposal,
by tying *successfully* the iliaca communis in a case of aneurism
of the internal iliac artery; an operation which in every point of
view does him great credit, and the following account of which
cannot fail to be read with peculiar interest. " The tumour was
of large size, protruding the belly considerably at the iliac region;
the patient suffered most excruciating pain, which appeared to
increase as the tumour enlarged. Dr. Mott's incision extended
from the external abdominal ring, to one or two inches above
the crest of the ilium, dividing the tendon of the external oblique,
and cutting through part of the origins of the internal oblique
and transversalis. He then cautiously raised the peritoneum
with his fingers, and succeeded in detaching it entirely from the
tumour and vessels, without doing it the slightest injury. The
artery was then examined, and the aneurismal dilatation was
found to cease at about half the distance between the bifurcation
of the aorta and the origin of the internal iliac branch. The
ligature was passed from the outside of the vessel, by the aid of
the instrument devised by Drs. Parrish and Hewson,* carefully
avoiding the iliac vein. The protrusion of the intestines ren-
dered this part of the operation the most difficult. After the
ligature was passed around the vessel, the wound was held open
in such a manner as to allow the medical gentlemen present to
see, and satisfy themselves of the exact situation of the ligature,

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* A modification of Dr. Physick's instrument for taking up deep-seated arteries.

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which was just below the bifurcation of the aorta into the primitive iliacs, and on the side of the sacro-vertebral promontory. The ligature was then drawn tight and secured; the pulsation of the tumour ceased; its size was much diminished, and the patient was relieved from the agonizing pain, previously unremitting. The wound was lightly dressed, and the patient put to bed; the limb of the side operated on was cold, as might be anticipated; it was wrapped in cotton, and covered up to preserve the temperature until the circulation should be restored. To the great surprise and satisfaction of the surgeon, in a little more than half an hour after the operation, the circulation and temperature were entirely restored, and all fear respecting the supply of blood to the limb effectually dissipated. No untoward circumstance occurred after the performance of the operation. The patient complains of no inconvenience, except a peculiar sensation of fulness or tension in the limb, as if the small vessels had not yet become accustomed to their new office in sustaining the great mass of the circulation for the support of the member."*

Sir Philip Crampton, of Dublin, took up the common iliac artery in 1828, and Mr. Guthrie, of London, performed the same operation in 1833. Both patients, however, died. Mr. Guthrie, in speaking of Dr. Mott's case has, inadvertently, stated that the operation did not succeed—a mistake extremely important to have corrected.

* Philad. Journ. of the Med. and Phys. Sciences for May.

SECTION VII.

POPLITEAL ANEURISM.

THE popliteal artery is peculiarly subject to aneurism ; so much so, that many surgeons consider the disease nearly as frequent as that of aneurism of the aorta. It may arise either from a wound, or from a diseased condition of the coats of the vessel ; but the latter is by far the most common. It is difficult to assign very satisfactory reasons for the extraordinary frequency of this complaint ; for although there can be no doubt that the almost incessant motion of the knee joint, the great weight it is accustomed to bear, the shocks it is liable to, and the resistance which the blood must often encounter from the acute angle formed by the artery when the leg is bent upon the thigh, will contribute more or less to the rupture of the coats of the artery ; yet the same causes should operate, to a certain extent, upon arteries of the axilla and elbow ; *true* aneurism, however, of the axillary artery, is rather uncommon, and that at the bend of the arm almost unknown.

However induced, popliteal aneurism may be known by the situation which the tumour occupies between the ham-strings by its distinct pulsation in the early stages of the disease, by its gradual increase, by the great pain and numbness in the ham and calf of the leg, occasioned by pressure on the branches of the sciatic nerve, by the general swelling and œdema of the limb, —from the veins and lymphatics being obstructed,—by coldness of the whole limb, from diminished supply of arterial blood, by want of pulsation in the tumour, after it has attained a large size, and by the contraction and injury of the knee joint—which is almost sure to follow the disease when of long standing.

TREATMENT OF POPLITEAL ANEURISM.

So few patients recovered, after the old operation of opening the sac of the popliteal aneurism and tying the artery imme-

diately above it, that many intelligent surgeons abandoned the
practice altogether, and in place of it amputated the thigh.
How much we owe to the illustrious Hunter for his discovery
of the true mode of managing the disease, may easily be esti-
mated, when I state that any surgeon who should now venture
to amputate, except under very particular circumstances, in
any case of aneurism, must encounter the severest censure and
disgrace.

The operation, upon the Hunterian principle, as now usually
performed, is as follows. An incision is made, while the patient
is in the recumbent position, along the inner margin of the sar-
torius muscle, commencing about two inches and a half below
Poupart's ligament, and extending downwards between three
and four inches, through the integuments of the thigh. Having
reached the sartorius, its inner edge may be gently separated
from the surrounding cellular membrane, and being held to one
side by an assistant, the surgeon next proceeds to divide, to the
extent of an inch, the fascia lata of the thigh, beneath which he
will find the femoral artery and vein and the saphena nerve en-
closed in their sheath. The sheath being opened, and care
taken to exclude the nerve and vein, the ligature is passed by
the aneurismal needle, around the artery and tied. The wound
is afterwards dressed in the usual way.

Femoral aneurisms are, comparatively, rare in the United
States; for the late Dr. Physick never operated more than five
times. Dr. Warren has operated four times for aneurism and
twice for wounds, successfully. I myself have operated six or
seven times. On the other hand, Dr. Mott has operated *forty-
nine* times for aneurism and wounds, and has lost but two
patients. How is this difference to be accounted for? By the
circumstance, perhaps, of the population of New York being
made up chiefly of foreigners, especially British, by the active
and bustling life led by two-thirds of the inhabitants, as well as
the extraordinary reputation acquired, deservedly, by that gen-
tleman; who, it is well known, turned his attention, at a very
early period, to the diseases of the vascular system.

SECTON VIII.

ANEURISM BY ANASTOMOSIS.

THIS variety of aneurism was first particularly noticed by Mr. John Bell,* and denominated by him aneurism by anastomosis, on account of the tumour being formed of an assemblage of small arteries and veins, with an intermediate cellular structure. " The tumour," says he, " is a congeries of active vessels, and the cellular substances through which these vessels are expanded, resembles the cellular part of the penis, the gills of a turkey-cock, or the substances of the placenta, spleen, or womb." Aneurism by anastomosis often arises from some slight injury; the tumour at first is scarcely perceptible; gradually, however, it enlarges, and acquires a thrilling, pulsatory, or jarring motion, which, together with its evident vascularity, forms its chief characteristic. In the early stages, the skin is seldom discoloured, but in the latter it has a mottled or purple hue, arising apparently from numerous small sacs of blood distributed throughout the tumour. These sacs, towards the surface, are apt to fret and take on ulceration : when this occurs, troublesome and very profuse hemorrhagies ensue. Frequently the disease seems closely allied to those vascular specks or growths, so common on the head and other parts of new-born children, known by the name of *nœvi materni.*

TREATMENT OF ANEURISM BY ANASTOMOSIS.

I have never known more than one instance of *spontaneous* cure of aneurism by anastomosis: this happened several years ago in a child of the present Chief Justice of the United States. The patient was under the care of an able and accomplished physi-

* See Principles of Surgery, vol. i. p. 456.

cian—Dr. William Bradley Tyler, of Fredericktown—who con-
sulted me respecting the case.   The tumour filled up the hollow
behind the angle of the jaw, involved a part of the ear, was
very large and vascular, and pulsated with such violence as to
appear, when the child cried, ready to burst.   I advised the
speedy removal of it, by the knife, as the only mode of saving
the child's life, and it was resolved, for this purpose, to bring it
to Philadelphia.   The journey, however, was delayed, in con-
sequence of a fever with which the patient was attacked, and
which continued for a considerable time.   From that period the
tumour diminished, and shortly afterwards disappeared—leaving
in its place only a loose bag or fold of skin.   The records of
surgery do not furnish, I believe, a similar termination.

Two operations have been proposed for the cure of aneurism
by anastomosis—*compression* and *excision* of the tumour.   The
first seldom answers, but, on the contrary, generally aggravates
the disease ; the second is always hazardous, and never succeeds
unless every vestige of the tumour be completely eradicated.
Mr. John Bell laid it down as a rule never to be deviated from
—" not to cut into the tumour, but cut it out."   This, however,
if it be a large aneurism, cannot always be done at once, or so
readily as might be imagined.   At all events, it is easier said
than done.   Very small tumours of this description, especially
if seated over a bone, may, no doubt, be removed by one or two
sweeps of the knife ; but to point out what I conceive to be the
true mode of managing this disease after it has attained an in-
ordinate bulk, I relate the following case.

Elizabeth Loush, a married woman, twenty-five years of age,
residing in the neighbourhood of Reading, came to Philadelphia
in the month of April, 1823, anxious to obtain relief for a very
large pulsating tumour, which nearly covered the right side of her
head, and sometimes bled so profusely from numerous ulcerated
spots on its surface, as frequently to endanger her life.   This
tumour had existed from infancy, but its increase was so gradual,
and the pain attending it so inconsiderable, that it gave her little
uneasiness. After her marriage, however, and especially during
her second pregnancy,—in which she was advanced four months
at the time I saw her,—the growth of the swelling was so rapid,
its pulsation so alarming, and the hemorrhagies from it so fre-
quent and debilitating, that she was prepared to submit to any

operation I might propose for her relief. I was aware at once
of the nature of the disease, and saw plainly the necessity of
acting promptly and decidedly. To have dissected off a tumour
of such magnitude, and so extremely vascular, at a *single* ope-
ration, would have been little better than madness. I resolved
to proceed in a very different manner, and having placed my
patient in a private department of the Philadelphia Hospital,
I commenced without delay a series of operations. My first
object was to cut off temporarily the chief supply of blood to
the tumour. With this view, I made several incisions, each
about an inch long, through the scalp and at some distance
from the margin of the tumour, and tied the chief branches of
the occipital and temporal arteries, many of which were en-
larged to the size of the common carotid. Having in this way
encircled the diseased mass, I had the satisfaction to observe
the pulsation diminish, and the tumour partially to shrink ; the
hemorrhage, also, from the surface had ceased. A slight ery-
sipelas of the scalp followed the operation. This occasioned
a week's delay ; in the mean time, the blood was evidently
finding its way again through the anastomosing vessels to the
tumour. An incision was made about two inches long, by a
single stroke of the knife, through the integuments to the bone,
commencing near the back part of the ear, and midway be-
tween the edge of the tumour and the line at which the arte-
ries were taken up in the first operation. An incredible quan-
tity of blood issued in a moment from every part of the wound;
in a few moments, however, every vessel was secured. The
cut was then repeated to the extent of three inches more, and
the vessels in like manner secured. By this time the patient
was so extremely faint, as to render it impossible to proceed
further ; indeed, many of the spectators supposed her to be
dying. Without delay, therefore, she was conveyed to bed,
and the wound dressed, by interposing lint between its edges to
prevent their reunion. In ten or twelve days the patient had
so far recovered her strength, as to enable her to submit to a
further incision of the scalp, commencing at the place where
the last operation had terminated. This operation was also con-
tinued as long as the patient could bear it, or as was deemed
prudent. Lint was then placed in the wound, and the patient
put to bed, and carefully nourished for a fortnight, at which

time the third and last operation was performed—by dividing
the remaining portions of the integuments, and removing the
tumour from the bone.   This was accomplished with com-
parative facility, the tumour being by the preceding operations
nearly drained of its blood, and almost insulated.   Care was
taken in separating the diseased mass not to remove the peri-
cranium ; the bones, therefore, notwithstanding a great portion
of the parietal and occipital was exposed, did not exfoliate, but
were covered in a few days by florid and healthy granulations,
the edges of the wound gradually approximated, and were so far
closed in four or five weeks, as to enable the patient to return
to the country, where in a little time longer her health was per-
fectly re-established, and at the end of the usual period, she was
delivered of a promising son.   An idea may be formed of the
magnitude and appearance of this tumour, by an examination of
the drawing in Plate XI.

Some surgeons may possibly feel inclined to imagine that a
ligature upon the carotid would have saved both myself and
patient a great deal of trouble, and have answered all the pur-
poses of the apparently complicated operation I have described.
I have the most perfect conviction, however, that such an expe-
dient would have proved at least abortive, if not hazardous, and
that, whatever benefit may have resulted from the practice in
the cases detailed by Travers, Dalrymple and others, where the
tumours were small, no prospect of advantage can be held out
for such an operation, when the disease is far advanced and the
swelling large.   In corroboration of this opinion, I may state
that I performed an operation for a disease, in many respects
similar to that of Elizabeth Loush, in February, 1830, upon
Mr. David C. Ballard, of Albemarle County, Virginia, who had
previously submitted to the operation of tying up the occipital
artery—enlarged five or six times beyond its usual dimensions
—and without the slightest diminution of the pulsation of the
tumour.   Not satisfied, however, with this experiment, I de-
termined to repeat it before resorting to the excision of the
aneurism ; but the operation proved fruitless, and only served
the purpose of lessening the pulsation for two or three days.
Firm compression, too, of the carotid on each side, although
made with great accuracy, and continued for some time, pro-
duced no alteration in the size of the swelling or in its pulsation.

Plate XI V. 2
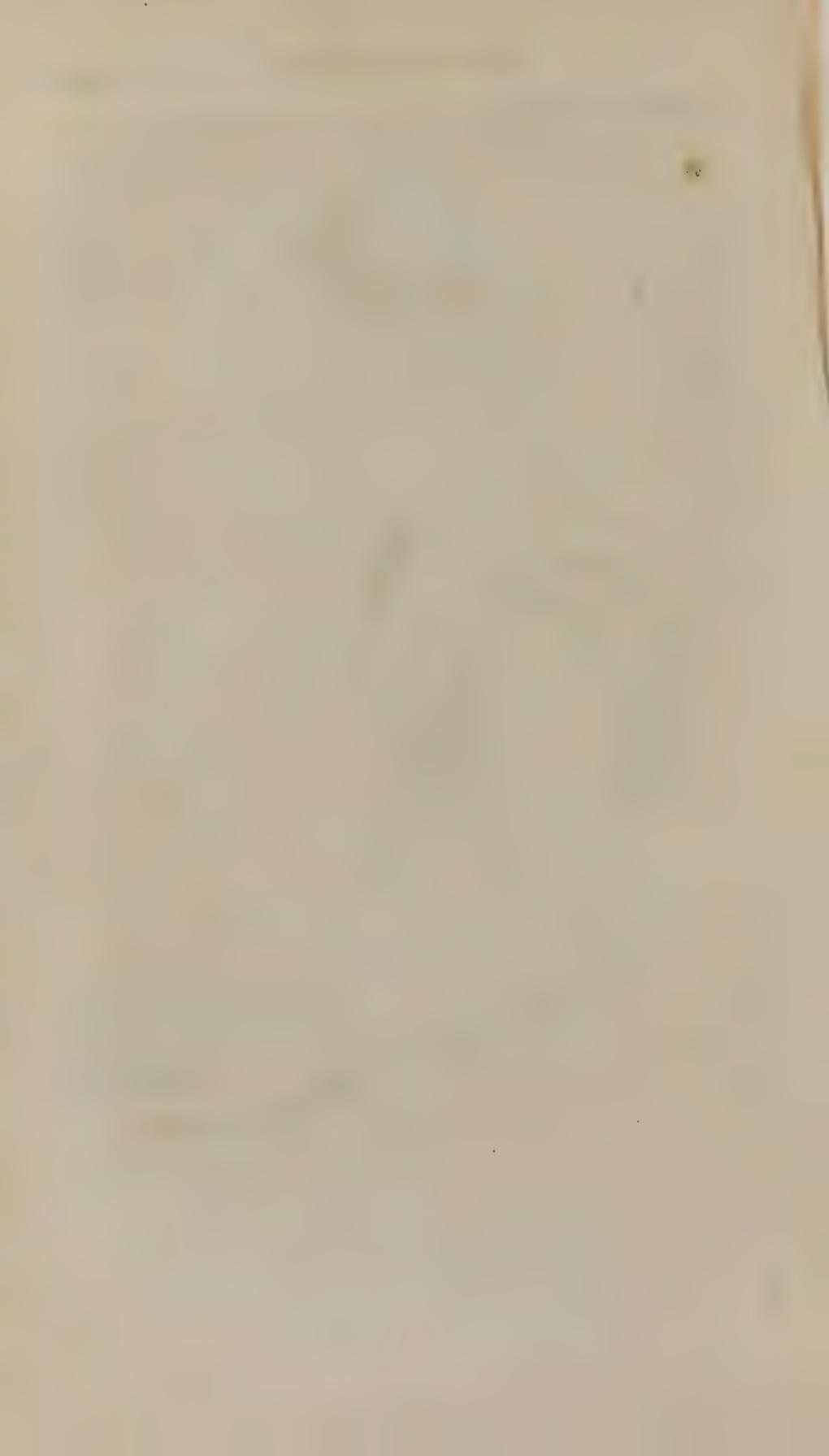
Influenced by these circumstances, I determined to remove the tumour, by a series of operations, and was rewarded for the trouble and difficulty I experienced with a perfect cure of the disease. During each operation, an immense number of large and small arteries were divided, anastomosing, apparently, with all the vessels of the scalp, convincing all who witnessed the operations, of the impossibility of curing such tumours by any other means than those I had recourse to. My friend, Professor Mussey, has detailed an interesting case of this description, in which he tied the carotid, without effect, and was obliged, eventually, to pursue the course I have recommended.

SECTION IX.

VARICOSE ANEURISM.

VARICOSE aneurism is that variety of the disease, in which a communication is established directly or indirectly between an artery and vein, in consequence of a simultaneous wound in both vessels. Dr. William Hunter was the first who gave any regular account of the disease, though cases of it had been previously recorded by Sennertus and others. The disease is comparatively rare, but is generally met with at the bend of the arm in the usual place of venesection, by which operation it is commonly produced. Three or four instances are related of its having occurred in the ham and thigh, from gun-shot and other wounds. It may take place in any situation where a large artery and vein are in contact, or near each other, and happen to be punctured at the same moment. Under these circumstances it usually happens that there are two wounds in the vein and one in the artery; that the external wound in the vein heals, while the internal remains open and receives a stream of blood from the corresponding orifice of the artery; that the edges of these openings and the sides of the vein and artery to a certain extent become united by the adhesive inflammation, by which an unnatural route is established for the circulation in that portion of the body which happens to be the seat of the injury. Instead, however, of the artery and vein being always thus united, so as to afford a direct passage to the blood, it occasionally happens, that they are separated some distance from each other, so that when wounded, the blood is poured from the artery into the adjacent cellular membrane, out of which a sac is formed, and this sac being placed between the two vessels, the blood is first discharged into it, and afterwards into the vein. Mr. Hodgson is of opinion that these varieties of

the disease are entitled to different names. The former he calls *aneurismal varix*, the latter *varicose aneurism*, without, I conceive, sufficient reason ; for the only difference* between them is, that in the one case the circulation between the vessels is *direct* in the other *indirect*. The symptoms, moreover, are commonly the same. These symptoms are an unnatural distension, or varicose enlargement of the injured vein and of the veins in its vicinity, which is particularly conspicuous at the immediate seat of the disease, and communicates to the finger a peculiar, pulsatory, thrilling sensation, or vibratory motion, that may be compared to the forcible separation of the fibres of a quill, or, as remarked by Dr. Hunter, to the noise produced in the mouth by continuing the sound of the letter R in a whisper. Not only is there an enlargement of the vein, but of the artery also, and in some instances to a considerable distance above the seat of the wound. The limb beneath the tumour is frequently emaciated, from being defrauded of its due proportion of blood.

An exceedingly well marked case of varicose aneurism I met with in 1813. The subject of it was upwards of sixty years of age, and had been wounded by a bayonet at the bend of the arm, which, no doubt, transfixed the artery and vein ; for from that moment a tumour, possessing all the characters I have described, began to form and gradually increased until it attained the size of a large egg. The veins communicating with it were uncommonly large, varicose and tortuous. Enlargements, also, of the artery, at the bend and middle of the arm and above the clavicle, were very manifest; all of which possessed a strong, pulsatory, and, at the same time, oscillatory or tremulous motion. Although the patient had been, after his wound, and indeed up to the period I met with him, a hardworking creature, little or no inconvenience was experienced from this disease, and he applied to me on account of another affection unconnected with his aneurism. The case was in every respect so strongly marked, that I was very anxious to possess an exact resemblance of the original. With this view I took an impression of the arm in plaster, nearly as high

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* The two diseases, however, may terminate in a very different manner, or require a different treatment, as will be explained presently.

as the shoulder, and from it a cast* in wax, from which the drawing in Plate XII. has been copied.

TREATMENT OF VARICOSE ANEURISM.

The most common form of varicose aneurism—that in which the artery and vein communicate directly with each other— very seldom requires any other treatment than moderate com- pression. Indeed, even this is not always necessary, and may, sometimes, prove injurious, by obstructing the passage of the blood into the vein and forcing it into the cellular membrane, thereby causing the second variety of the disease. In most cases, it will be sufficient for the patient to abstain from violent or laborious exertions of the limb in which the aneurism is seated. But even this does not always cause the tumours in the vein and artery to enlarge, for, in the case I have detailed, the patient had been accustomed to laborious employments for twenty or thirty years without any material alteration in his disease. If an operation is performed for this disease, it should be done in the early stage of it.

When an aneurismal sac is formed out of the cellular mem- brane, between the artery and vein, it frequently attains so large a size, as by pressure to injure the surrounding parts, or by bursting or taking on ulceration, to endanger the patient's life. To guard against, or obviate such consequences, an ope- ration may possibly become necessary. This was first per- formed by Mr. Park,† of Liverpool, and next by Dr. Physick.‡ In both instances, the brachial artery was tied above and below the sac, and the patients recovered. Of late years, the opera- tion has been performed repeatedly; but success is not so apt to follow as in cases of common aneurism; indeed it has been remarked by most surgeons that mortification is by no means an uncommon consequence of the operation for varicose aneur- ism. Phlebitis, too, from occasional necessity of including the

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* This preparation is still contained in my cabinet, and illustrates, most satis- factorily, the appearances presented by varicose aneurism.

† Medical Facts and Observations, vol. iv.

‡ Coxe's Philadelphia Medical Museum, vol. i.

Plate XII V.2

veins in a ligature as well as the artery, sometimes takes place. The Hunterian operation in this variety of aneurism is out of the question, and ought never, from the want of success hitherto attending it, to be had recourse to.

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On Aneurism, consult J. Bell's Principles of Surgery, vol. i.; Abernethy's Surgical Works, vol. i. p. 272, edit. 1819 ; Scarpa on Aneurism, by Wishart, 1819 ; C. Bell's Operative Surgery, vol. i. p. 70 ; Pelletan, Clinique Chirurgicale, tom. i. and ii. ; Richerand's Nosographie Chirurgicale, tom. iv. 4th edit.; Burns's Observations on some of the most important Diseases of the Heart, on Aneurism of the Thoracic Aorta, &c. p. 203 ; Burns's Observations on the Surgical Anatomy of the Head and Neck, edit. 1824 ; Hodgson's Treatise on the Diseases of Arteries and Veins, containing the Pathology and Treatment of Aneurism and Wounded Arteries, 8vo. 1815, decidedly the most valuable work extant ; Breschet, Mem. Chir. sur Differentes Especes d'Aneurysmes, 4to. Paris, 1834 ; Cruveilhier, Anat. Patholog. Paris, 1829 ; Dupuytren, Leçons Orales, Paris, 1832 ; Manec, Traité Theorique et Pratique de la Ligature des Arteres, Paris, 1832 ; Roux's Nouv. Elem. de Med. Oper. 8vo. Paris, 1813 ; Guthrie on Diseases of Arteries, 8vo. London, 1831 ; J. Wardrop on Aneurism, 8vo. London, 1828.

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CHAPTER XIII.

DISEASES OF THE VEINS.

Previous to the discovery of the circulation of the blood, the structure and functions of the venous system were very much studied ; since that period, the attention of surgeons has been directed almost exclusively to the arteries, and the veins have been neglected. Like the arteries, however, they are subject to important changes, or to disease in their coats, which frequently give rise to serious, and even fatal consequences.

A common disease of the veins is phlebitis or inflammation. This may arise from wounds, as in venesection, or from the application of the ligature. In either case the lining membrane of the vessel is the chief seat of the disease, and along this membrane the inflammation, sometimes, travels until it reaches the heart—producing great irritation and symptoms resembling those of typhus fever. In other instances an effusion of coagulable lymph takes place, and the sides of the vessel being thus glued together, frequently in different places, the extent of the inflammation is limited, or pus, if it should form, prevented from passing through the circulation, and the patient's life, probably, thereby saved. This obliteration of a vein from the effusion of lymph, is sometimes produced slowly by pressure from an adjoining aneurismal sac, or some other species of tumour. In all such cases the circulation is carried on by the collateral veins, which anastomose so freely throughout the body with the main trunks, that little inconvenience is experienced from the obstruction, even although veins of the largest class be obliterated. Inflammation of the veins sometimes terminates in ulceration, and gives rise to hemorrhage. This, however, is a

rare occurrence; the formation of calcareous concretions in the venous coats is equally rare. Veins are occasionally ruptured from muscular exertion, from engorgement or over-distension of their coats by blood, produced by sudden immersion in a cold bath, or by other causes. But the most common venous affection, perhaps, is varicose enlargement, of which it will be proper to treat in a separate section.

SECTION I.

VARICOSE VEINS.

THE deep-seated as well as the superficial veins, are frequently rendered varicose by undue muscular exertion, by interruption of the circulation from ligature, by the pressure of tumours, by collections of hardened fæces in the intestines, by the enlargement of the gravid uterus, &c. If from any of these causes the disease is once induced, it continues gradually to increase and to extend from one vein to another, until numerous ramifications are effected. The veins of the upper extremities rarely become varicose, but those of the leg and thigh, especially the saphenæ and their branches, are very prone to the disease. In the commencement, numerous small circumscribed swellings may be observed. After a time, the venous trunks and branches appear enlarged throughout their whole extent, and run in a serpentine or tortuous direction. Sometimes they are knotted or doubled upon each other, and these gyrations are particularly conspicuous in the neighbourhood of the valves. In proportion as the veins enlarge, the support afforded by the valves to the column of blood is diminished, until it is entirely lost. Not only are the veins expanded greatly beyond their natural size, but their coats also, in many instances are very much thickened. This, together with the coagulated blood which not unfrequently fills their cavities, renders them solid and incompressible. Under particular circumstances, these coagula are absorbed, and the diseased veins are converted into cords. In by far the greater number of cases, however, the vessels remain pervious, and the fluid blood still circulating

through them sluggishly, keeps up incessant irritation, and gives rise to inflammation in the surrounding cellular membrane, that often terminates in extensive and very painful ulcerations.* Profuse hemorrhage, from sudden rupture or ulceration of a varicose vein, followed by extreme debility, and even death, has repeatedly happened.

TREATMENT OF VARICOSE VEINS.

In addition to compression with the roller and laced stocking, which, in slight cases are well calculated to effect a cure, the older surgeons frequently extirpated large portions of the trunks or branches of varicose veins, sometimes with success, but often with an unfavourable issue. On this account the operation has long been abandoned, and that of simply including in a ligature the largest varicose trunk substituted in its stead. This mode of practice, although familiar to Celsus and other ancient writers, was introduced to the notice of the profession many years ago by Sir Everard Home, and has since been executed repeatedly by different surgeons, generally without any serious consequences, but sometimes with a fatal result. Many surgeons of the present day, therefore, never resort to the operation, especially as there is no certainty of a radical cure. Sir Astley Cooper, a surgeon of great experience, pointedly condemns the practice, and states that he has known it to prove fatal in eight instances. " Another overwhelming objection to the operation," says he, " is, that when it does not prove fatal, its ultimate effects are useless. If I were asked which of the following operations I would rather have performed upon myself, viz. the saphena major vein, or the femoral artery tied, I certainly should choose the latter."† In opposition to Sir Astley's statement, that the operation is never permanently useful, I may remark, that I have practised Sir Everard Home's plan of taking up the vena saphena above the knee, for more than twenty-five years; in numerous instances, without an unpleasant symptom, and generally with great relief to the patient and a speedy cure of the accompanying ulcer. It is an opera-

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* See an account of the varicose ulcer, in vol. i. p. 161.
† The Lectures of Sir Astley Cooper, by Tyrrel, vol. i. p. 205.

tion, however, that I have never undertaken lightly or upon every common occasion, being fully aware of the danger of inflammation extending along the inner surface of an injured vein to the heart. Of late years, Sir Benjamin Brodie, in order to avoid the occasional ill effects of the ligature, has proposed, as a substitute, the simple division of the vein by the knife; but this operation, also, it is stated, has sometimes been followed by fatal consequences. "For this operation," says Sir Benjamin, "I have generally employed a narrow sharp-pointed bistoury, slightly curved, with its cutting edge on the convex side. Having ascertained the precise situation of the vein, or cluster of veins, from which the distress of the patient appears principally to arise, I introduce the point of the bistoury through the skin on one side of the varix, and pass it on between the skin and the vein, with one of the flat surfaces turned forwards and the other backwards, until it reaches the opposite side. I then turn the cutting edge of the bistoury backwards, and in withdrawing the instrument the division of the varix is effected. The patient experiences pain, which is occasionally severe, but subsides in the course of a short time. There is always hemorrhage, which would be often profuse if neglected, but which is readily stopped by a moderate pressure, made by means of a compress and bandage carefully applied."

The plan usually resorted to by European surgeons, at the present day, is the one proposed by Davat—the introduction of a long needle, or pin, beneath the vein, previously raised along with the skin, and surrounded by the twisted suture. This, as generally acknowledged, has been followed by no unpleasant symptoms, and has, therefore, superseded excision, the cautery, the caustic of Mayo, the incision of Brodie, and other methods. Sir Benjamin, himself, indeed, has long ago abandoned his own operation.

In performing operations upon veins, the surgeon should be aware of the danger of air entering their cavities. Several interesting cases have been reported by Dupuytren, Sir Astley Cooper, Roux, Warren, Mott, and Stevens, of death from this cause, or of the patients being saved by pressure on the orifice in the vein, or by the timely operation of encircling it with a ligature. The most interesting case of all, however, is that recorded by Professor March, of Albany, the candid relation of

which does him great credit. " The external jugular vein was divided very near the part at which it unites with the internal jugular. At this moment a phenomenon occurred which was most alarming. It was the noise of a strange rushing of air, as though the trachea or cavity of the thorax had been cut into, and seemed to threaten the instant dissolution of the patient : a noise resembling the sudden pouring of a liquid from a junk bottle. The patient was instantly seized with tremors and convulsions, became pulseless, the lips livid, frothed at the mouth, and the pupils dilated to the greatest possible extent. The moment the occurrence happened, the finger was placed on the mouth of the wounded vein; and the operation being suspended, the patient seemed to revive from the effects of diffusible stimuli, and partially roused. The operation was then resumed and very soon completed. The patient, however, expired without a struggle, before he could be removed from the operating table."

Petit was in the habit of opening varicose veins with a lancet, and withdrawing the coagulated blood ; after which, in many instances, he found that the vessels became obliterated, and the patient experienced no further inconvenience from the disease. Even drawing off, occasionally, small quantities of fluid blood by puncture, produces great relief. This mode of treatment, indeed, conjoined with the use of the roller, astringent washes, and an elevated position of the limb, will often effect a cure, and should always be tried before an operation is resorted to.

SECTION II.

CIRSOCELE.

THE veins of the spermatic cord, and those of the scrotum, often become varicose. To the former the term cirsocele, has been applied—to the latter varicocele. The two diseases sometimes exist simultaneously. Cirsocele is chiefly met with amongst young, vigorous, unmarried men, those especially who have led very chaste and exemplary lives. In several instances, however, I have known it connected with despondency or hypochondriasis. When examined, the whole of the cord appears to consist of a congeries or bundle of knotted and tortuous veins, which feel like a bunch of worms wrapped around and twisted upon each other. Generally, the disease first shows itself at the bottom of the testicle or scrotum, and then gradually travels up the cord, producing more or less weight, uneasiness, or pain. When the patient is laid in the recumbent position, the tumour subsides, and the diseased veins feel soft and flaccid. The moment, however, he stands erect, especially if, at the same time, the upper part of the cord be compressed with the finger, the tumour reappears. This will serve to distinguish cirsocele from hernia, hydrocele, and other complaints.

Cirsocele is more common on the left side than on the right— a circumstance first noticed by Morgagni, and attributed by him to the left spermatic vein, entering the renal. By others it has been supposed owing to pressure of the colon on the left spermatic veins. Sometimes the disease is met with equally large on both sides, and occasionally the swelling becomes so considerable as to bury the testicles and prevent them from being felt.

TREATMENT OF CIRSOCELE.

It is seldom that the testicle, or cord, sustains any injury from varicose enlargement of its veins. Sometimes, however, it happens that the testicle, from long continuance of the disease, or from neglect, wastes away. To guard against this, and to relieve the unpleasant weight and uneasiness, of which most patients complain, there is nothing so effectual as a *bag* truss, so contrived as to suspend the testes and give them a firm and equable support. These trusses are of various forms and materials, and may be found in most of the instrument-makers' shops. The best I have seen, are the French, and those invented by Dr. Chase of this city, and by Dr. Maxwell of the United States navy. Conjoined with this, cold astringent washes, applied by means of linen rags to the affected parts, will be found highly serviceable. Robust and plethoric patients will also derive benefit from general and local blood-letting, from purging, low diet, &c. Extirpation of the diseased veins has been practised by some modern surgeons, in cases of cirsocele attended with severe pain and extraordinary enlargement of the cord and testicle. I have seldom met with cases requiring an operation of the kind. When, however, they become very large and painful, it may be necessary to perform Davat's operation by passing two needles, an inch apart, under the veins of the cord,—excluding the vas deferens,—and twisting the interrupted suture around them. The operation has usually proved successful, much more so than the plans of Breschet, Fricke of Hamburgh, and Mayo, and less painful and serious than removal of part of the scrotum, as practised by Lehman and others. An ingenious mode of passing the pins and ligatures has been employed by Dr. Norris of this city.* Wormald has employed a metallic ring for obliterating varicose veins of the cord and scrotum. I have not found it, however, useful.

On Diseases of the Veins, consult Hunter's Observations on the Inflammation of the Internal Coats of Veins, in Transactions for the Improvement of Medical and Chirurgical Knowledge, vol. i. p. 18; Hodgson on the Diseases of Arteries

* See Philadelphia Journal of Med. Science, No. xlvi. p. 299, Feb. 1839.

and Veins. p. 511; Observations on Varix and Venous Inflammation, &c., by Richard Carmichael, in Transactions of the Association of Fellows and Licentiates of the King's and Queen's College of Physicians in Ireland, vol. ii. p. 345; Home's Practical Observations on the Treatment of Ulcers of the Legs, to which are added some Observations on Varicose Veins, &c., p. 274; On Wounds and Ligatures of Veins, by B. Travers, in Surgical Essays by A. Cooper, &c. part i. p. 227; Brodie's Observations on the Treatment of Varicose Veins of the Leg, in Medico-Chirurgical Transactions, vol. vii. p. 195; Oldknow's Case, in which the Operation of Tying the Vena Saphena, for the Cure of an old Ulcer of the Leg, terminated fatally, in Edinburgh Medical and Surgical Journal, vol. v. p. 175; C. Bell's Operative Surgery, vol. i. p. 89 and 94; Delpech's Precis Elementaire des Maladies Reputées Chirurgicales, tom. iii. p. 251, article Varices.

CHAPTER XIV.

INJURIES OF THE HEAD.

In a pathological, as well as practical point of view, there are no diseases more deserving of the surgeon's attention, than those usually comprehended under the name of injuries of the head. These embrace several affections very distinct from each other in character, and requring the most opposite modes of treatment. On this account, it will be proper to consider them in separate sections. It must not be supposed, however, that these diseases are always so well marked and insulated in their symptoms, and altogether so independent of each other as never to exist simultaneously. This is so far from being the case, that we often find them blended or intermixed in a manner so extraordinary, as to puzzle or confound the most intelligent practitioner. Indeed, as has been well remarked by the experienced Hennen, " the young surgeon, who, for the first time, witnesses a series of injuries of this description, will at every step have something to unlearn ; he will find symptoms so complicated, contradictory, and insufficient to give any rational clew to their causes ; diagnostics, of the truth of which he had read himself into a conviction, so totally unsupported by the results of practice ; and the sympathies he was led to look for as infallible accompaniments of certain states of disease, so often wanting altogether, that he will probably be inclined to relinquish the hope of ever arriving at a correct theory, or at least he will enter the clinical ward with the pride of science considerably subdued."

SECTION I.

FRACTURE OF THE SKULL.

FRACTURES of the skull differ widely from each other in appearance and extent ; hence their division by writers into several varieties, such as fissure, counter-fissure, depressed fracture, double depressed or camerated fracture, stellated fracture, punctured fracture, &c. These distinctions are of some importance, since the mode of treatment must in many instances depend upon the particular variety of fracture that may happen to exist. By the term fissure, is understood a simple crack or division of one or more bones of the skull ; by counter-fissure, a separation produced at a point opposite to that upon which the force was applied. A depressed fracture is that in which the bones are forced beneath their natural level. The fracture is said to be camerated when " the centre is depressed in a direct line, and the sides decline towards that centre, like the form which the two hands make when laid together edgeways."* A stellated fracture takes its name from the resemblance it bears to a star. Punctured fracture is the result of a pointed instrument driven through the bone. These varieties of fracture, are owing in part to the shape of the instrument by which they are produced, to the force with which it is impelled, and to the inequality of thickness and strength of the different bones composing the skull. Were it not for this inequality, counter-fissure would very frequently take place ; for the skull being formed upon the principle of a hollow sphere, any force applied to it must extend its influence throughout the circle, and produce fracture at a point opposite to that upon which the force was exerted. But this is prevented by the circumstance of some of the bones being thinner and weaker than others. If, for example, a man in falling backwards receives a violent blow upon the occiput, this bone being unusually thick and strong, does not give way, but the percussion is propagated towards the temples where the bones

* See J. Bell's Principles of Surgery, vol. ii. part ii. p. 795.

are weak, and here the fracture occurs. The same thing may arise from a blow upon the top of the head. In like manner, a force applied to the frontal bone, will often, instead of fracturing that bone, fracture the orbitar plate. My preceptor, Sir Charles Bell, has satisfactorily illustrated these and several other interesting points relating to fractures of the skull in a most ingenious paper, contained in the first volume of his "Surgical Observations." In the paper referred to, Sir Charles not unaptly compares the skull to the roof of a house, in which the sphenoid bone serves as the *tie beam* to prevent the *rafters*, or parietal bones, from giving way. Again ; the broad and expanded surface of the petrous part of the temporal bone is supposed to bear a resemblance to the *groining* of an arch in masonry, and, as such, to afford a foundation for the parietal bones to rest upon, while the mastoid, zygomatic, and petrous processes are likened to arches built under a wall to increase the security of the foundation.

TREATMENT OF FRACTURE OF THE SKULL.

Simple fissures or fractures of the cranium, unaccompanied by injuries of the brain or its membranes, seldom demand particular treatment. Indeed, there is reason to believe that such accidents often escape the notice of the surgeon, and are cured without his assistance. But even when the fracture is known to exist, the patient's safety may be endangered by officiousness in tracing it, or attempting its elevation. The rule, in all cases of the kind, should be to refrain from an operation so long as the contents of the skull remain unaffected, and of this the surgeon is to judge by the *symptoms*. Fractures and fissures of the base of the skull are extremely dangerous, and few patients recover after such accidents—especially when blood has been discharged from the ears. The force being applied, as in falls from a height upon the head, the foramen magnum and cuneiform process of the occipital bone are generally fractured to a greater or less extent. Of course, no local treatment, under such circumstances, can be of any avail, and if the patient recovers, it must be from strength of constitution, or from general means.

It will always be proper, to remove sharp points, or ragged edges of bone, by the cutting forceps, trephine or saw, to prevent them from irritating the dura mater, brain, or the soft parts exterior to the skull. In certain cases, also, the bone becomes carious some weeks after the fracture, and, if suffered to remain, may destroy the patient, by exciting inflammation upon the surface of the brain. The treatment necessary for fractures, conjoined with injury of the brain, will be pointed out under the head of *Compression* of the Brain.

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SECTION II.

CONCUSSION OF THE BRAIN.

It often happens that a man receives a smart blow upon the head, which does not fracture the skull, or materially injure the brain, but disorders the intellectual functions, and produces vertigo, sickness of stomach, trembling of the limbs, dimness of vision, &c. This may be considered a case of slight concussion. In more severe injuries of the kind, the symptoms are different. The accident is immediately succeeded by insensibility, coldness of the skin, relaxation of the extremities, feebleness and irregularity of pulse, difficulty of breathing, and dilatation of the pupil. The breathing, however, though weak and labouring, is commonly free from stertor. After a time the sensibility is partially restored, so that the patient may be roused from the apparent sleep or lethargy in which he is usually found, and made to answer questions, especially those relating to the seat of his injury. Gradually the pulse rises, and the natural breathing is restored, the pupil contracts and the body recovers its warmth. There is now danger of inflammation of the brain, since the pulse, in proportion as the immediate symptoms wear away, continues to augment in volume and strength, and the blood is determined forcibly to the head. Independently of this, in most cases of severe concussion, there is reason to believe that blood is poured out upon the brain or its membranes, in greater or less quantity, and afterwards becomes a source of irritation.

TREATMENT OF CONCUSSION OF THE BRAIN.

If called immediately after an accident, and symptoms of concussion are found to exist, the surgeon should be very careful not to adopt the practice, but too common among the ignorant and vulgar, of bleeding the patient instantaneously. But

he must wait until the pulse rises, or until reaction is established, and this usually takes place in an hour or two; he will then bleed to diminish vascular action, and to prevent inflammation of the brain, which, in severe cases of concussion, is extremely apt to ensue. If blood-letting, however, is pernicious in the first stage of concussion, the administration of stimulants will, generally, prove equally so; for although the patient may seem to be benefited for the time, by a mouthful of wine or brandy, yet the effect of such practice will be, in the end, to hurry on the cerebral excitement. A few teaspoonsful of cool water, immediately after the injury, will often be found singularly useful in reviving the patient, and cannot interfere with the after treatment. With regard to the continuance of blood-letting, much will depend upon the extent of the injury, and the age and constitution of the patient. Many instances are recorded of death from profuse evacuations of blood, designed to obviate inflammation of the brain. A medium must, therefore, be observed. In addition to blood-letting, low diet and purgatives should be resorted to. Applications to the head, which ought, previously, to be shaved, will also be found highly serviceable, such as cloths dipped in cold water; and after full benefit has been derived from these, blisters may be used with decided advantage: keeping the head in an elevated position, also, during the whole treatment, will greatly contribute towards the prevention and removal of inflammatory action.

SECTION III.

COMPRESSION OF THE BRAIN.

COMPRESSION of the brain may arise from three different causes—from a depressed fracture, from effused or extravasated blood, and from suppuration within the brain, or its membranes. It seldom happens, however, that a mere depression of the bone, unattended by other injury, will give rise to severe symptoms, or to such as characterize a compression of the brain. Indeed, the records of surgery furnish numerous examples of perfect recoveries after the most extensive depressions, from which the patients sustained very little inconvenience, and for the relief of which no operations were performed. On the other hand, cases are now and then met with, where, from depression of both tables of the skull, or from extensive fracture of the inner table, the most urgent symptoms have followed, but have been speedily relieved upon elevating the bones to their natural level.

Compression arising from extravasation of blood is very common, and may accompany fracture of the bone, or be independent of it. Sometimes the blood is poured out between the dura mater and the skull, in which case the membrane is actually shaken from the bone, and the blood issues from numerous small vessels. Sometimes the middle artery of the dura mater is torn by the rough edge of the fractured bone, or by the force which produced the fracture, and then the hemorrhage is very sudden and profuse. At other times, the vessels of the brain are torn, and the blood is spread over its surface, forced into its substance, or poured into the ventricles. In most cases of extravasation, there is commonly an interval between the injury and the appearance of the symptoms of compression, and this, when it does.occur, may be considered as a sufficient characteristic of its nature; for immediately after the vessels are torn, there is no compression, but as the blood accumulates and

extends itself widely, the symptoms denoting that condition are gradually developed and finally confirmed.

Matter, like the coagulum formed by extravasated blood, may give rise to compression; it is always, however, the result of inflammation, and, on this account, does not immediately follow an injury of the skull. Often it proceeds from the irritation produced by fragments of the shattered internal table, or from sharp or ragged spicula wounding the dura mater or brain. A depressed fracture, too, although it may not have produced, at first, symptoms of compression, will sometimes eventually cause suppuration on the surface of the dura mater. Even when the skull has not been fractured, but severely bruised, suppuration may follow the caries of the bone. Extravasated blood, also, may give rise to suppuration between the bone and dura mater or within the brain.

If from either of the foregoing causes compression should arise, it will be denoted by the following symptoms. The pulse will be found slow and regular, the pupils of the eyes greatly dilated and insensible to the strongest light, the breathing stertorous, slow and difficult, the limbs loose or yielding, and sometimes paralytic, the insensibility complete, so much so that the patient cannot be roused by the most powerful stimuli. There is no sickness or vomiting. These symptoms will distinguish it from *concussion*, in which the pupils are either contracted or moderately dilated, the pulse weak and tremulous, the breathing without stertor, the insensibility partial, the affection of the stomach almost universal. It must be confessed, however, that we seldom meet in these two states of disease, with the symptoms so insulated and distinct, as to enable us accurately to separate them; that, on the contrary, they are commonly combined, and so intermixed as often to create great confusion and doubt in the mind of the surgeon.

TREATMENT OF COMPRESSION OF THE BRAIN.

When called to a patient labouring under all the symptoms of compressed brain, the surgeon can scarcely do wrong in drawing blood from the arm, and in repeating the operation as often as the pulse may seem to require it. In addition to

this treatment, purgatives should be administered; and by pursuing this plan, he will often have the satisfaction to find that the symptoms abate, or are so entirely removed as to render an operation unnecessary; should he be disappointed, however, in this expectation, and an operation be afterwards demanded, the patient, from the previous depletion, will have a better chance of recovery. If, notwithstanding this treatment, the comatose symptoms continue, and there is reason to believe that the brain is oppressed by a coagulum, the trephine must be resorted to, whether the skull be fractured or not, and the coagulum removed. The same observation will apply to fracture with depression, always recollecting, however, that the *symptoms* call for the operation, and not the mere fracture; and that the skull, if the brain be uninjured, will often unite like any other fractured bone, even although the depression be left. On the other hand, it should be stated, that a depressed fracture, which at first did not interfere with the functions of the brain, will sometimes give rise to inflammation of the dura mater or brain, and subsequently to compression from the formation of matter; and that these consequences might have been prevented, perhaps, by a timely operation. But a great deal of judgment will be required to enable the surgeon to anticipate such consequences.

The *instruments* that may be required for an operation on the skull, are two or three trephines, the largest about an inch in diameter, the second three-quarters, and the third half an inch; all of them provided with sharp teeth widely set, and with *centre pins; Hey's saw*, a *lenticular, trepan forceps*, two *elevators*, a *brush* for cleaning the trephine and saw, a *toothpick* or *probe, tenacula, sponges, crooked needles, ligatures*, a *scalpel*, &c.

The object the surgeon has in view in applying the trephine, is either to make an opening for the removal of coagulated blood, or for the introduction of the elevator beneath a depressed bone. In the former case a large trephine should be employed, in the latter a small one. Very frequently, however, it happens, that there is a sufficient space between the edges of the fragments of bone to insinuate the elevator, and with it restore the depressed portion to its natural level. Under such circumstances, the trephine need not always be employed. It is com-

Plate XIII. N. 2.

Fig. 1.
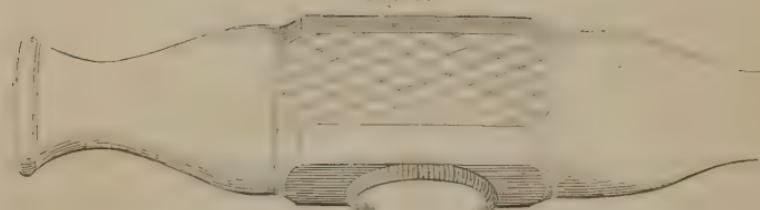
Fig. 2.
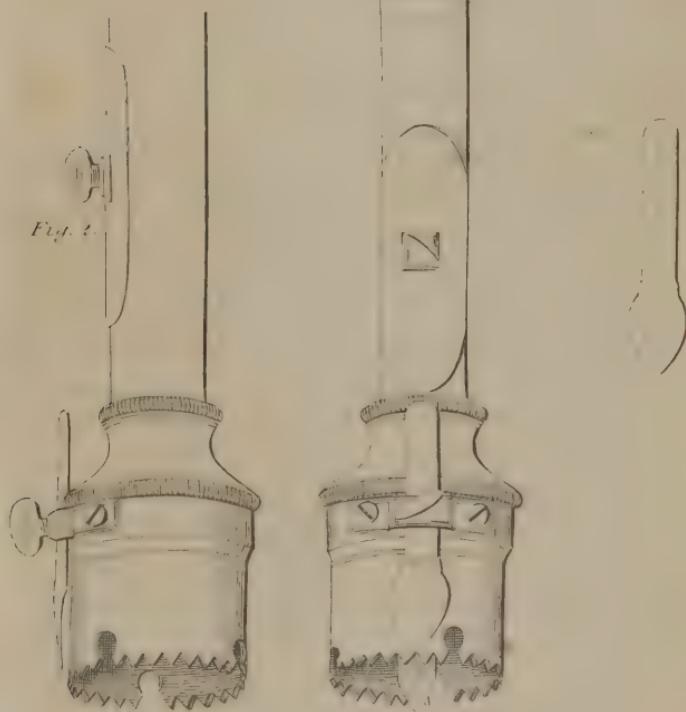
monly recommended to plant the crown of the trephine partly upon the sound, and partly upon the depressed bone. Whenever the latter is sufficiently firm to bear the pressure of the instrument, I prefer resting it entirely upon it, in order to save the sound bone.

If there is a wound of the scalp along with the fracture, it may be enlarged, if necessary, or so changed in shape, as to enable the surgeon to get at the bone, and effect his purpose in the easiest way possible. If the integuments remain entire, I would recommend an incision, in the shape of the letter D,—the rounded portion of the letter to be raised from the bone. The flap of the integuments being turned back, the *centre pin* of the trephine, without the preliminary measure formerly practised, of scraping away the pericranium,* is fixed upon the bone, and serves the purpose of guiding the saw, which being worked steadily backwards and forwards a few seconds, forms a track or gutter for itself, in which it will afterwards run without the assistance of the pin. The pin being withdrawn, or made to retire within the axle of the trephine, the operator continues to divide the bone—occasionally removing the saw and brushing away the sawings, or dust, to prevent them from clogging the teeth—until he has reason to believe that he is nearly through. He should then examine carefully and very repeatedly with the probe or tooth-pick, lest he cut into the dura mater or brain, before he is aware. Frequently it occurs, that one part of the bone is divided whilst another remains entire. The surgeon in this case should discontinue the saw, and attempt the removal of the circular piece of bone, by breaking up its attachment with the forceps. Any irregularity or projecting edge of bone that may remain may be smoothed off by the *lenticular.* If blood

* Having seen much mischief result from the common practice of rasping the pericranium, and from the teeth of the saw when applied in the way above directed, I have used, for some time past, a trephine, with a small moveable lancet attached to its outer surface, the extremity of which can be made to project about the sixteenth part of an inch beyond the teeth of the instrument. The object of this is to cut the pericranium smoothly, instead of *tearing* it. As soon as this is accomplished, the operator may retract the lancet and proceed to saw the bone. The advantages gained by this simple proceeding must appear too obvious to require illustration; and yet I am not aware that either the principle upon which the operation is founded, or the instrument itself, has ever before been suggested or applied. (See Plate XIII. figs. 1 and 2.)

be extravasated between the dura mater and skull, and the perforation has been made in the proper place, the coagulum will be presented as soon as the circle of bone is removed, and evacuated through the hole by the pulsation of the brain. If the blood be effused between the brain and dura mater, this membrane will sometimes be forced into the opening, and the dark blood will appear beneath it. The surgeon should then cautiously open the membrane, and evacuate the blood; though the operation does not commonly succeed when this is necessary. Still it is the only chance the patient has. In many instances, the moment the brain is relieved from the pressure of a depressed bone, or from the load of extravasated blood, the symptoms of compression instantaneously disappear, and the patient recovers his reason. In other cases the comatose state continues, and no benefit is derived from the operation.

If any large arteries are divided during the operation, they may be taken up by the tenaculum or needle. In a very extensive fracture of the skull, which I attended many years ago with Dr. Gustavus Warfield, an eminent practitioner of Maryland, I had occasion to tie up the middle artery of the dura mater: this was easily accomplished by the needle. Sometimes this artery runs in a groove of the bone: in that case, it may be compressed by a plug of soft wood. After the common operation of the trephine, the edges of the wound should be drawn together by adhesive straps, and secured by a pledget and light dressing.

For extensive extravasations, one or more openings with the trephine may become necessary. As it cannot always be determined readily whether there is extravasation or not, Mr. Abernethy has suggested the ingenious expedient of cutting down upon the bone, and scraping the pericranium before perforating the skull. This operation is founded upon the fact of the free interchange of vessels between the dura mater, bone, and pericranium, or rather upon the circumstance of the latter membrane being in a great measure dependent for its supply of blood upon the dura mater. Hence it was inferred, that if by a shock communicated to the skull the dura mater was torn up from the inner surface of the skull, the vessels passing through the bone to the pericranium must also be torn, and consequently that that membrane, if scraped, would not bleed, and

vice versa. Mr. Abernethy has found this to hold true in practice, but his statements have not been confirmed *in toto* by other surgeons.

With the exception of the occipital bone, the trephine may be applied with equal effect, and comparatively with little danger to any part of the skull. When the frontal sinus is fractured, and it is necessary to trephine its inner table, two trephines should be employed—a large one for the outer portion of the bone, and a smaller one for the inner portion. This mode of performing the operation was first pointed out by Sir Charles Bell. It is founded upon the unequal form of the sinus, in consequence of which a single trephine could not be made to work perpendicularly against its inner table. If a patient recovers after the application of the trephine, the external wound gradually heals up, and the opening in the bone is covered by a membrane, formed partly from the pericranium, and partly from the dura mater, which serves afterwards to protect the brain; but the bone is seldom, if ever, regenerated. If the patient dies after the operation, it is commonly from inflammation of the brain, or from suppuration within its substance. This will show the propriety of endeavouring to combat the inflammatory action, both before and after the operation. The trephine, when employed to evacuate matter from the brain, is seldom found to succeed. It is sometimes employed for the relief of epilepsy. By Sir A. Cooper, Dr. Warren, of Boston, and Dr. Dudley, of Kentucky, several successful cases of the kind have been reported. When performed with this view, however, the operation has often failed—as was the case in a patient of Dr. Jackson, upon whom I operated in the winter of 1835, at the Philadelphia Hospital, who recovered from the operation, but without benefit to his disease. Dr. Dudley's cases are very extraordinary.

SECTION IV.

INFLAMMATION OF THE BRAIN.

If, from any of the causes pointed out in the preceding sections, inflammation of the brain should arise, it will be characterized by the following symptoms. The face becomes flushed, the eyes are red and impatient of light, the pupils are contracted, the skin hot, the pulse hard and quick, and the tongue dry. The pain in the head is intensely severe, the scalp is puffy and œdematous, retains the impression of the finger, has a peculiar glossy aspect, and the wound, if there be one, discharges a sanious matter. Soon after the appearance of these symptoms, the patient is seized with rigors or shiverings, which occur at irregular intervals, and are always indicative of great danger. During the early stages of the inflammation, the patient often continues sensible for days together, and answers questions very distinctly : when the disease is further advanced, however, he becomes irrational, moans or sighs heavily, tosses from one side of the bed to the other, mutters constantly, withdraws his hand from the surgeon, and seems unconscious of all that is passing around him. These symptoms are sometimes followed or accompanied by hemiplegia, and violent convulsions. If the patient survive until the suppurative stage is established, the matter will be found either between the dura mater and bone, between the pia mater and brain, in the substance of the brain, or in the longitudinal sinus.

TREATMENT OF INFLAMMATION OF THE BRAIN.

To counteract inflammation of the brain, or its membranes, the most active antiphlogistic measures must be pursued. Blood-letting is more to be relied on than any other remedy ; but the surgeon should not be satisfied with merely drawing blood from the arm ; he should take it freely from the scalp by leeches, or

open the temporal artery, or the jugular vein. Purgatives, also, will be found essentially necessary, and after full effect has been produced by these and by blood-letting, the scalp may be covered with a large blister, which should be repeated as often as the symptoms require it. If, in spite of these remedies, the inflammation terminate in suppuration, and give rise to the symptoms of compressed brain, the trephine should be resorted to, though it must be confessed that the patient's chance of recovery is very limited, when such a measure seems to be called for. In some instances, months or years elapse before inflammation or suppuration of the brain takes place from injuries of the head. A carious bone, in such cases, will commonly be found to be the cause of the mischief; but, unfortunately, the removal of it by the trephine, will seldom prevent the patient's death.

SECTION V.

FUNGUS CEREBRI, OR ENCEPHALOCELE.

AFTER extensive fractures, and the removal of large pieces of the skull, or after the operation of the trephine, a tumour having all the appearances of a vascular organized growth, sometimes sprouts from the brain, fills up the openings in the bone, projects beyond the scalp, and often acquires considerable magnitude. Commonly this morbid enlargement is first seen making its way through a laceration in the dura mater; but in other instances the dura mater ulcerates, from being forced repeatedly by the pulsations of the brain against the sharp edges of the bone, and the tumour appears immediately beneath, and afterwards increases with wonderful rapidity. Mr. Abernethy is inclined to believe that "this disease frequently consists of a tumour formed by coagulated blood, and that an organized fungus could hardly be produced in so short a time as that in which these tumours are usually formed." Sir Charles Bell, on the contrary, maintains that the tumour is vascular, and formed of the substance of the brain itself; that it bleeds when torn or cut, which would not be the case if formed of mere coagulum; that it is affected, like spongy granulation, by caustic, and collapses after death; all of which, in my opinion, furnish decided evidence of its vascular nature. Indeed, Sir Charles's views have been amply confirmed by the observations and dissections of subsequent writers. In particular, Mr. Stanley having had occasion to cut off a tumour of this description, found, upon dissection, "the exterior of the tumour to consist merely of a layer of coagulated blood, and the rest of the mass of brain, possessing a natural appearance, the distinction between the cortical and medullary matter being readily seen with the convolutions and pia mater dipping down between them."

Tumours, very different in structure from the foregoing, sometimes sprout from the external surface of the dura mater. They are apt to follow blows and other injuries of the head, in which the bone has been bruised, but not fractured. The patient, in

such cases, usually complains of deep-seated, severe headach, which may continue for weeks or months together. At last, the swelling is observed beneath the scalp, communicating a pulsatory motion to the finger, and rapidly enlarging, without the integuments taking on ulceration—though this sometimes happens in the advanced stages of the disease. If the integuments are divided, and the tumour examined, it will be found to consist of a vascular growth from the surface of the dura mater; a further examination will also show that the bone has been absorbed by the pressure of the tumour. Hernia cerebri is sometimes congenital, or occurs in infants before ossification is completed. There are two varieties of the disease—one in which the tumour is covered by the scalp, the other where that integument and sometimes the dura mater are deficient.

TREATMENT OF FUNGUS CEREBRI.

The termination of this disease is almost always unfavourable, especially when it is followed by symptoms of compression of the brain. Spontaneous cures sometimes, though rarely, take place—from the fungus being strangulated by the rapid increase of the surrounding granulations, or by pressure from the edges of the bone. From what I have seen of the disease, I am disposed to believe that light dressings, conjoined with occasional moderate pressure upon the tumour, will prove of more service than any other remedies. Caustics and excision have been highly extolled by some writers, and as pointedly condemned by others. " In the treatment of this disease," says Sir A. Cooper, " you are to apply to the fungus a piece of lint, wetted with liquor calcis; and over this a strap of adhesive plaster; when you examine the parts, on the following day, you will find the fungus considerably diminished; you are then to use a thicker piece of lint, and the strapping as before. Pursuing this plan, you at length bring the fungus to a level with the scalp; but this is not sufficiently low for your purpose; therefore, you must proceed until you have succeeded in getting it on a level with the bone; in which position it must be cautiously preserved, when at last the scalp heals over it, and your object is accomplished."

When a fungus protrudes from the external surface of the

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dura mater, and increases to such an extent as immediately to endanger the patient's life, its removal by the knife should be attempted. The operation, however, seldom succeeds.

Consult Pott's Chirurgical Works, by Earle, vol. i.; Abernethy's Surgical Works, vol. ii.; Desault's Surgical Works, by Smith, vol. i.; John Bell's Principles of Surgery, vol. ii. part ii.; Sir Philip Crampton, in Dublin Journ. of Med. Science, vol. ii.; Hennen's Principles of Military Surgery, p. 277 ; Thomson's Report of Observations made in the Military Hospitals in Belgium, p. 49 ; C. Bell's Operative Surgery, vol. i. p. 403 ; C. Bell's Surgical Observations, p. 461 ; Dorsey's Surgery, vol. i. p. 291 ; Richerand's Nosographie Chirurgicale, tom. ii. p. 230 ; Lassus's Pathologie Chirurgicale, tom. ii. p. 252 ; Callisen's Systema Chirurgiæ Hodiernæ, tom. i. p. 728, et sequent; Sewall on Injuries of the Head, in Philad. Journ. of Med. Science, vol. ii. p. 62 ; Sir Astley Cooper's Lectures on the Principles and Practice of Surgery, with Additional Notes and Cases, by Frederick Tyrrel, Esq. vol. i. p. 252 ; Sir Benj. Brodie, in Med. Chirurg. Transact. vol. xiv. ; Velpeau, De l'Operation du Trepan, 8vo. Paris, 1834; Dupuytren, Leçons Orales ; Dudley, in Transylvania Journal of Medicine ; Stanley's Cases of Hernia Cerebri, in Med. Chir. Transact. vol. viii.; Dr. S. P. White, in New York Med. and Surg. Journ., on Hernia Cerebri; Dr. Frank Hamilton on Encephocele, in Philad. Journ. of Med. Science, for 1837, p. 537.

CHAPTER XV.

LOCAL DISEASES OF THE NERVES.

THE diseases to which the nervous tissue is subject, have received, with few exceptions, but little attention from surgical or medical writers. This has been owing, no doubt, in great measure, to the complicated structure of the nerves, their minute division, and intricate and endless distribution, the study of which alone would be sufficient to embrace no inconsiderable portion of time. There is great reason to hope, however, that the splendid discoveries of Sir Charles Bell, discoveries, which have not only immortalized their author, but have shed a halo of glory around his country, have so unravelled the mysteries of the nervous system, as to open a rich mine for the observations and experiments of future inquirers, and that, at no distant day, the diseases of the nerves will be as susceptible of demonstration as those of the arteries and some other textures. Under the heads of Neuritis, Neuralgia, Neuroma, and Tetanus, I shall endeavour to include the chief surgical diseases of the nerves.

SECTION I.

NEURITIS.

INFLAMMATION of the neurilema, or of the substance of a nerve, whether acute or chronic, and to designate which writers have employed the term neuritis, appears to be by no means unfrequent. Cases of the kind, strongly marked, and minutely detailed, have been furnished by Sir Everard Home, Martinet, Weinhold, Brandreth, Swan, Descot, Langstaff, Lobstein, Ha-

milton, and others. The symptoms are deep-seated pain, some-
times constant, sometimes periodical, swelling and redness of
the part affected, spreading in the course of the nerve or its
branches, and followed by induration of the surrounding parts,
and, eventually, by thickening of the nerve, from deposition
of coagulable lymph in the interstices of its fibres. In some
instances the pain is intensely severe, accompanied by spasms
of the muscles, contraction of the limbs, inordinate constitu-
tional disturbance, hysteria, and even epilepsy. Paralysis, or
loss of sense of feeling in the affected part, is a frequent atten-
dant, and in chronic cases of neuritis, is associated with extra-
ordinary coldness and insensibility of the skin.

The *causes* of the disease are either constitutional or local.
Incised, contused, lacerated, and gun-shot wounds, pressure upon
nerves by ligatures, or by tumours, and various other injuries,
may be considered as the most common of the local agents.
Ulceration of the nervous tissue, as appears from the observa-
tians of Swan, Craigie, and others, sometimes follows an in-
flamed nerve. Swan, in particular, has related cases of ulcers
of the leg in which the nerves were found, upon dissection, in
an *ulcerated* state in some parts, thickened in others, or else sur-
rounded or complicated with fungus.

TREATMENT OF NEURITIS.

In acute neuritis, constitutional, as well as local remedies in
the shape of depletion, are chiefly to be relied on. Low diet,
general blood-letting, leeches, purgatives, blisters, position and
absolute rest, are essential in most aggravated cases of the dis-
ease. Sometimes it resists the combined operations of them all.
In such cases, the preparations of opium and colchicum may
be tried. Stramonium and hyoscyamus, in chronic cases, may
be also resorted to. When there is reason to believe that the
disease has been the result of local irritation, and is kept up by
the pressure of a tumour, or by consolidation of the parts in
immediate contact with the inflamed nerve, from ligatures or
the cicatrices of wounds, a division of the parts by the knife, or
amputation of the limb may become necessary. In a very
interesting essay on the effects of wounds of nerves, by my

friend, Mr. John Hamilton, of Dublin, numerous cases are related, to illustrate the symptoms of neuritis, and the efficacy of incisions, or removal of a portion of the nerve, at or above the seat of injury. Not only in the human subject have such operations been practised advantageously, but in other animals. " Sir Philip Crampton told me," says Mr. Hamilton, " that a most valuable horse, whilst clearing a hedge, suddenly fell lame, and continued so for two years, unable to put his foot under him. Sir Philip, on examining the leg, thought he felt a tumour in the situation of the radial nerve. He cut down on it, and found a tumour on the nerve, which he removed, along with a portion of the nerve. On dividing the tumour, he discovered a thorn in its centre. The horse perfectly recovered, so as afterwards to sell for its full value." Langstaff has related the case of a female, whose forearm was amputated on account of an injury which had been followed by violent symptoms. The operation was productive of no benefit. Some months afterwards, a second amputation was performed above the elbow, the nerves were drawn out to the extent of half an inch, by the tenaculum, and cut off. From that moment the patient was relieved of pain, and never had the slightest return of the severe symptoms she had so long suffered from. Cold water, or strong solutions of acetate of lead, will occasionally relieve neuritis, after the failure of other remedies. A striking case of the kind is related by Mr. Hamilton, as having occurred in the practice of Sir Philip Crampton.

" When very painful ulcers exist," says Swan, " ointment made with powdered opium, or lotions made by mixing powdered opium with water, or lime-water, should be applied on lint to the sore, and then a folded cloth moistened with water, or laudanum and water, over the surrounding skin, and attention should be paid to the digestive organs." The same surgeon has recommended, in case of ulcerated nerves, the division of them, taking care to make the separation as far as possible from the ulcer, in order to prevent the divided extremities of the nerve from afterwards taking on ulceration.

SECTION II.

NEURALGIA.

This, as the name implies, is a painful affection of one or more
nerves, exceedingly common, which may occupy any organ or
texture of the body ; though it attacks the face more frequently
than any other part.   By most writers it has been described under
the title of tic douloureux.   Whether seated in the head, face,
cheek, spine, abdomen, or extremities, the symptoms are nearly
the same.   These are, a peculiar, thrilling, darting, vibratory pain,
commencing at a single point, and shooting along the course of
one or more nerves, their filaments or branches : the pain is
paroxysmal and periodical, and along with it there is generally
muscular twitching.   The degree of suffering varies in different
patients, according to the parts attacked and the duration of the
complaint.   Some patients suffer immensely, and are so agonized
as to be driven almost to desperation.   But, generally, the pain,
although extremely severe and frequent, is not intolerable, and
is the more readily borne, as the paroxysms are succeeded by
remissions, although there is seldom perfect immunity from
suffering.   For weeks, or months, the disease may endure, and at
last wear away, and the patient console himself with the hope
that it has been conquered.   With all the irregularity of an in-
termittent, however, it comes back, and sometimes renews the
attack with more than usual ferocity.   In other instances the
periodical visitation is not manifested, and for months and even
years, the patient may be entirely free from the disease.   The
local symptoms enumerated, are in some cases preceded by
general indisposition, such as chilliness, creeping sensations, gas-
tric, uterine, and arthritic derangements.   In other cases, the
part is assaulted, without previous notice, and with a suddenness
and impetuosity, that surprises and alarms the patient.   Marks
of inflammatory action are seldom visible in the part affected,
nor is the circulation so far disturbed, in the generality of cases,
as to amount to fever, even when the pain is at the height of
paroxysnal intensity.   Every age and sex are amenable to

neuralgic invasion; but middle-aged females, of various tem-peraments, and whose systems have been impaired by dyspeptic agencies, are most exposed to its assaults: on the other hand, very vigorous and athletic young men, and even children, some-times become a prey to its ravages. Besides the parts already mentioned as most frequently implicated in neuralgia, we find the uterus, testicles, urinary bladder, kidneys, liver, spleen, rec-tum, stomach, heart, lungs, and brain, under the occasional in-fluence of its operation.

The *causes* of neuralgia, are local and constitutional. Among the former may be enumerated, mechanical lesions of every description, such as incised, lacerated, punctured, penetrating, contused, gun-shot, and poisoned wounds. Pressure, of various kinds, whether acting directly on individual nervous trunks, or branches, through the medium of cicatrices, spicula of bone, ligatures, corsets, bandages, or indirectly, will often give rise to the disease. Abscesses, ulcers, caries, particularly when seated in or near the roots of the teeth, or about the face, or scalp, are equally powerful in inducing neuralgic aggression. The most prominent of the *constitutional* causes are, palludal exhalations, dyspepticde pravities, uterine irregularities, arthritic diatheses, hemorrhages, exposure to cold, mental emotions, masturbation, excessive venereal excitement and indulgence, immoderate use of tobacco, &c.

With rheumatism, and other complaints, neuralgia is often con-founded. But rheumatic pain is pulsatile, dull, has no distinct remission, and is widely spread, while that attendant upon neu-ralgia is penetrating, vibratory, paroxysmal, and often periodical, and unaccompanied by inflammation. Tic douloureux of the face may be distinguished from the tooth-ach, by the pain attendant on the latter being deeply seated and continued, and by the swelling of the face and gums which accompanies tooth-ach, and often ends in suppuration; and is unattended by that excruciating torture peculiar to neuralgic diseases.

TREATMENT OF NEURALGIA.

The local and constitutional causes of neuralgia being very numerous and diversified, it is natural to infer that the curative indications, and modes of treatment, should hold a proportionate

correspondence. We find, accordingly, that countless remedial contributions have been furnished towards the removal of the complaint, and that as soon as one specific has acquired a reputation and lost it, its place has been filled by another. " Sic unda supervenit undam."

The remedies, then, for neuralgia, must be looked upon, in most cases, as palliative merely. Under this head, may be enumerated general and local blood-letting, blisters, stimulating plasters, caustics, opiate and saturnine lotions, fomentations, poultices, acupuncturation, compression by the roller or tourniquet, opiate, and mercurial frictions, electricity, galvanism, magnetism, the internal use of opium, belladonna, stramonium, hyoscyamus, quinine, sulphuric ether, arsenical solution, valerian, peroxide of zinc, sub-carbonate of iron, emetics, colchicum, subnitrate of bismuth, warm-baths. Of all these, most benefit appears to have been derived from quinine, sub-carbonate of iron, and emetics.

So far back as the time of Vesaliu the celebrated anatomist and surgeon, the division of the nerve, in tic douloureux of the *scalp*, was practised successfully. In the case of Prince Charles, —son of Philip the Second, King of Spain,—who suffered immensely from a neuralgic affection of the scalp, succeeding a wound, Vesalius, by dividing that integument to the bone, effected a perfect cure in a very short time. Pouteau, one of the best of the older French surgeons, details two very interesting cases of the same kind ; and, by pursuing a similar practice, was equally successful. From the result of these operations, there is reason to believe the modern practice of dividing the branches of the fifth pair of nerves in tic douloureux of the face originated—a practice now seldom resorted to, experience having proved its general inefficacy. It is not easy to imagine, indeed, how such a measure should prove permanently useful, if the view taken by Sir Charles Bell, that " tic douloureux has its source in visceral irritation, communicated through the sympathetic nerve," be correct. Why, it may be asked, then, has the operation ever succeeded ? *Ultimately*, I believe, it very seldom has ; for, out of numerous cases reported, immediately after the operation, as successful, a very small proportion only have received permanent benefit—owing, perhaps, to the difficulty of selecting the precise nerve, or of cutting off its communication with adjoining branches ; but, above all, of preventing its *reunion*, even when portions of it have been cut out.

SECTION III.

NEUROMA.

By the term neuroma, is to be understood an enlargement or tumour of a nerve. There are three or four varieties of the disease—one which is solid, or sarcomatous, situated as an interstitial deposit between the fibrils of the nerve, and which, by involving a number of these fibrils, may attain considerable magnitude—another, in form of a tubercle, about the size of a pea, and which occupies, there is reason to believe, one or more of the subcutaneous nerves—a third, which is seated upon the extremity of a divided nerve, in shape of a button-like excrescence, and is produced by the application of a ligature—a fourth, which seems to consist of gelatinous matter enclosed in a cyst, and appears to be a secretion from the substance of the nerve.

The first variety of neuroma was particularly noticed by Sir Everard Home, who, in 1796, detailed two cases of it, the first of which occupied the outside of the biceps muscle of the right arm, just below the middle, was the size of a pullet's egg, extremely painful when handled, and, when exposed by the knife, was found connected above and below to a strong white cord, which turned out to be the musculo-cutaneous nerve. In the second case, the tumour occupied one of the large nerves which form the axillary plexus; and, when dissected out, was found of a yellowish white colour, three inches and a half long, two inches thick, and of an oval form. Sir Charles Bell, in 1809, published a very interesting case of tumour of the tibial nerve, produced by a fall over the side of a ship, the ham of the patient being caught by a projecting bolt. For a long time the patient suffered extremely, not so much from the tumour as from pain in the foot, and finally died, worn out by long-continued suffering and hectic. In 1812, I was consulted by a woman in the service of John Barney, Esq., of Baltimore, on

account of a tumour the size and shape of a goose egg, seated on the inner edge of the biceps muscle, near the middle of the right arm, very firm and solid to the touch, moveable, but not particularly painful. Upon cutting down to the tumour, and laying it bare, I found its upper and lower ends connected with a large white cord, which proved to be the median nerve. I hesitated, at first, about dividing the nerve, but concluded that it would be better so to do. Numbness of the arm, forearm, and fingers, particularly of the fore, middle and ring fingers, amounting almost to paralysis, followed the removal of the tumour. The wound healed kindly, however, and in a short time the general numbness disappeared, though it remained in the fingers, which were cold and almost useless, for nearly three years ; but, at the end of that time, was entirely removed, and the use of the fingers restored.

The second variety of neuroma has been described by Mr. Wood, of Edinburgh, and by Marshall Hall, under the title of " *subcutaneous tubercle.*" In all the cases detailed by Mr. Wood, the tumours were so excessively painful as to amount to agony. They were met with in different parts of the body, but generally in the extremities, and invariably occurred in females. Marshall Hall's patient, however, was a male.

The *button-like* excrescence, so often produced, by awkward and ignorant operators, in tying the extremities of nerves, along with the arteries, in wounds, and on the face of amputated stumps, particularly after flap operations, has been long familiar to surgeons ; but has been more pointedly noticed by the late Mr. John Bell, Hennen, and Larrey than any other writers. The pain following the application of the ligature, under such circumstances, is intensely severe, and, in the course of time, becomes agonizing beyond endurance, and sometimes gives rise to paralysis or tetanus. The ligature, too, instead of producing the effect it does when applied to an artery, remains on the nerve, which is comparatively indestructible, for months together ; and is with great difficulty pulled away, on account of the bulbous excrescence which is reared upon the end of the nerve, and is sometimes so large, as, in a case reported by Larrey, to resemble a mushroom. By some modern writers, it is said, that in proportion as the ligature compresses the nerve, lymph will be thrown out around the ligature, and that the sub-

stance of the nerve will be destroyed, and the separation of the ligature soon follow. Experience has taught me the reverse. Encysted neuroma has been noticed by Sir Everard Home, and by Swan. Epilepsy, and other diseases, have been known to follow neuroma.

TREATMENT OF NEUROMA.

Large tumours, situated among the fibrils, or involving the substance of a nerve, may give rise, as already remarked, to very urgent symptoms, or may destroy the patient. On the other hand, death has followed the extirpation of such tumours, or the functions of a part have been interfered with, or materially deranged, by the division of a large and important nerve, like the ischiatic or median. There seems, however, in most cases, to be no other resource than an operation; and this we are justified in performing, upon the ground that reunion of the nerve will take place, in the course of time, (even when the intermediate portion has equalled in length two or three inches, as proved by the result of the case in which I divided the median nerve,) and that death will be almost sure to follow, if the sufferings of the patient are not speedily mitigated.

The cases of *subcutaneous tubercle*, reported by Wood and Hall, were all cured, effectually, by extirpation. Dupuytren, who has also given a minute account, so far as his description can be depended upon, of the subcutaneous tubercle,—but under the title of encysted tumour,—concurs with Wood, in the statement that females are most subject to the disease, and that extirpation is the only remedy. By Dupuytren, moreover, the disease is considered as not seated in the nervous tissue, and as liable to terminate in cancer. An interesting case, corresponding with the description of that eminent surgeon, occurred in 1838, in the practice of my friend, Dr. Caspar Morris of this city. A tumour about the size of a pullet's egg, soft, woolly, slightly elastic, acutely sensible, feeling, when lightly touched, as if it contained rice, occupied the left shoulder of a gentleman about twenty-seven years of age, and was situated just where the suspender crosses the most prominent part of the root of the neck—being caused, indeed, as the patient supposed, by the

pressure of that article of dress. I advised, in consultation, extirpation, and performed the operation, by laying open the integuments, and dissecting out the whole of the sac and rice-like substance which it contained. The wound, however, did not heal, but became puffy and painful. Shortly afterwards, I performed a second operation, removing integuments, as well as the substance of the tumour, and, by making a very extensive dissection, succeeded in effecting a cure.

Nothing less than removal of the ligature will put a stop to the extreme suffering which follows the inclusion of nerves in wounds, aneurisms, and amputations. For months I have known the ligature to hold its place with the utmost tenacity, and the patient to be thrown into spasms upon touching the string in the gentlest manner. Even after it has been separated from the nerve the effect will remain, in some cases, for a long time. This was strikingly evinced in the case of Captain M——, who was blown up at Fort George during the late war with Great Britain, and had one of the nerves of an amputated leg included in a ligature. Symptoms of tetanus came on almost immediately, and the ligature was cut away; but for months afterwards his agony was extreme, especially upon sudden atmospheric changes. On account of his sufferings, having become my patient, I tried, ineffectually, various remedies; and only succeeded eventually in arresting the spasms and pain, by laying open the stump and applying the actual cautery to the injured nerve. Mayo and some others, unjustifiably, it appears to me, have resorted to amputation at the hip and shoulder, to remove painful tumours of the nerves after amputations and similar injuries. Hennen has furnished interesting cases of great distress following the tying of a nerve, and Larrey reports two fatal cases of tetanus from the same cause.

SECTION IV.

TETANUS.

A VIOLENT and extremely painful contraction of the voluntary muscles, without complete intervening relaxation, has been considered by most writers as constituting tetanus. Several varieties of the disease, differing from each other, chiefly in situation, and proceeding from different causes, have also been pointed out. These are *opisthotonos*, or a violent contraction and rigidity of the muscles of the back and posterior part of the neck, by which the body is bent backwards, or recurvated—*emprosthotonos*, or that variety in which the body is bent forwards—*pleurosthotonos*, or lateral inclination of the body—*rismus*, or locked jaw, in which the muscles of the lower jaw and throat are affected. Again; we have *traumatic* and *idiopathic* tetanus, and also the acute and *chronic*,—the former proceeding from wounds, the idiopathic from various causes, while the terms acute and chronic are intended to denote the period and duration of the attack.

Of these varieties, however, the *opisthotonos* is, by far, the most common, and whether the result of a wound, or of cold, or any other cause, is characterized by the following symptoms—painful rigidity of the neck, resembling rheumatism, difficulty of deglutition, followed by inability to swallow liquids, and in attempting so to do, by spasms in the throat. To these succeed, sooner or later, violent spasmodic, lancinating pain, which shoots, with the rapidity of lightning, through the chest, from the sternum to the spine, recurs at shorter and shorter intervals, and is augmented, at last, to an intolerable degree of intensity. With this peculiar symptom, which is strikingly characteristic of the disease, the contraction of the muscles of the neck, back, and jaw, keep pace ; the head, in particular, is thrown painfully backwards, and cannot be restored to its natural position, the breathing is interrupted by the action of the muscles of the neck on the windpipe, the pulse is fluttering, small and quick, the face flushed, the forehead wrinkled, the

eyes turned upwards or distorted, the nostrils dilated, and the
whole countenance greatly distressed. At last every voluntary
muscle of the body appears more or less implicated; those of the
abdomen are drawn up into knots, and the whole belly feels as
hard as a board. In proportion as the spasmodic contractions
increase, the head and lower extremities approach each other in
a backward direction, so that the body forms an arch towards
the bed, while its anterior part assumes the convexity of the
segment of a hoop—the weight of the body being sustained
upon the head and heels. By this time the jaws become im-
moveably fixed; but sometimes are occasionally relaxed in a
slight degree, and then suddenly snap together with a convulsive
jerk, that has been known, in some instances, nearly to sever
the tongue, which is very apt to be protruded, at every stage of
the disease, beyond the lips. The patient is scarcely a moment
free from the most agonizing spasms; but, notwithstanding his
extreme suffering, the intellect remains unclouded to the last, and
the pulse scarcely ever amounts to the height of fever. In general,
sudden and violent convulsions terminate the scene.

Traumatic tetanus may follow the most insignificant scratch,
in some instances, and in others, cannot be produced by the
most extensive laceration. Occasionally it shows itself almost im-
mediately, and in other cases, does not come on until the wound
is entirely healed. In general, however, it makes its appearance
before the tenth day, and where there is a tendency towards the
disease, may be induced in a very short time by exposure to
cold, or to a stream of cold air, even in the hottest weather. It
is most common in warm climates, and in the summer months.
Wounds in the palms of the hands or fingers, and especially in the
soles of the feet and toes, are most apt to give rise to it.   That
it derives its origin from wounded filaments, or trunks of nerves,
rather than from wounds of *tendons*, as formerly imagined,—
which are often divided in club foot,—there is every reason to
believe; for several cases have been reported where foreign
bodies have been found lodged in the substance of nerves, and
where wounds have been traced to one or more branches. On the
other hand, it must be confessed, that dissection has been fre-
quently unable to reveal to us the source of this inexplicable, and
most formidable malady.

TREATMENT OF TETANUS.

In the treatment of tetanus, the prospect of success will depend much upon the cause of the disease. When it arises purely from cold, from vegetable and other poisons, and is chronic, instead of acute, recovery often follows, even under the most opposite modes of treatment. But *traumatic* tetanus, generally defies the most vigorous and skilful efforts of the surgeon. So far as my own experience goes, I am inclined to rely, mainly, and from the first, upon very large doses of opium. Twenty-five years ago, I attended, along with the late Professor Baker, of Baltimore, a boy, seventeen years of age, who, from being precipitated from a scaffold, amidst a pile of bricks, had the bones of the forearm fractured about the middle, dislocated at the wrist, and protruded some inches. Tetanus followed in four or five days, and, as soon as its approach was announced, we commenced with opium in very large doses. Perceiving at once an amelioration of symptoms, the remedy was persevered in, and directions left with the mother of the boy to pour down laudanum, during our absence, whenever she perceived the spasms to come on. Our instructions having been rigidly adhered to, and the opiate exhibited almost without reference to quantity, the system of the patient became so saturated with the medicine that a perfect cure was effected, although the spasms continued, with more or less severity, for six or eight weeks. At one period of the disease, the boy took four, and sometimes five, hundred drops of laudanum in twenty-four hours. In a few other cases I have since succeeded in effecting cures by similar means; but, in the majority, have totally failed, in spite of opium in immense doses, and every other remedy that could be thought of. In one case of traumatic tetanus, under care of my friend, Dr. Antrim Foulke, a most respectable practitioner of Montgomery County, with whom I saw the patient about nine years since, a cure was effected through the medium of large quantities of opium and assafœtida. But the same treatment, although rigorously pursued, in a case which I attended with Dr. I. G. Nancrede of this city, was productive of no benefit whatever. As a general rule, poultices should be applied to the wound, in order

to excite the suppurative action, both in cases where we have reason to apprehend tetanus, and after that disease has come on.

The other remedies employed in tetanus, general as well as local, and still relied upon by some practitioners, may be barely enumerated. These are, the warm and cold bath, ardent spirits and wine, mercury, sudorifics, musk, volatile alkali, purgatives, elatereum, prussic acid, colchicum, electricity, tobacco enemata, turpentine, blood-letting, sub-carbonate of iron, digitalis, camphor, amputation, caustics and the actual cautery to the wounded part, or along the spine.

Of all these, however, wine and brandy, exhibited in large quantities, have been found, by the late distinguished Professor Hosack, of New York, to be the most useful. In several cases reported by him, perfect cures were effected by these remedies. His son, Dr. Alexander E. Hosack, has recently communicated to me, also, several cases of violent tetanus,—three of which arose from the insertion of an artificial tooth, and another from the removal of a tumour in the neck—most of which were cured by the same means. "Drs. Delafield and Wilkes," Dr. Hosack remarks, "visited the patients with me, and each patient drank from one to two pints of brandy a day, and also a bottle of wine for a number of days in succession."

Consult The Nervous System of the Human Body, by Sir Charles Bell, 4to. London, 1830 ; Swan on Diseases and Injuries of the Nerves, London, 8vo. 1834 ; Dissertations sur les Affections Locales des Nerves, par P. J. Descot, 8vo.; On Painful Subcutaneous Tubercle, by William Wood, in Edinburgh Medical and Surgical Journal, vol. viii. p. 238 ; Case of Painful Subcutaneous Tubercle, by Marshall Hall, ibid. vol. xi. p. 466 ; An Account of an Uncommon Tumour formed in one of the Axillary Nerves, by E. Home, in Transactions of Medical and Chirurgical Society, vol. ii. p. 152 ; C. Bell's Operative Surgery, vol. ii. p. 331 ; Of Nervous Ganglions, or Tubercles, by Baron Dupuytren, in Clinical Lectures on Surgery, translated by Doane, 8vo., Philad. 1833 ; Remarks on Tic Douloureux, with Cases, by N. Chapman, in Amer. Journ. of Med. Sciences, No. xxviii. 1834 ; On some Effects resulting from Wounds of Nerves, by John Hamilton, L. R. C. S. in Dublin Journ. of Med. Science.

On Tetanus, consult Larrey's Memoirs ; Hennen's Military Surgery ; Sir James M'Grigor, in Medico-Chirurgical Transactions, vol. vi. ; Cooper's Surgical Essays, &c. ; Essays by David Hosack, M. D. ; Abercrombie, on Diseases of Brain and Spinal Cord ; Obeirne, in Dub. Hosp. Reports, vol. iii.

CHAPTER XV.

AMPUTATION.

From the earliest periods the question of the propriety or im-
propriety of amputation, in certain diseases and injuries, has been
agitated with warmth, and even with acrimony—some contend-
ing that the operation was scarcely ever necessary, under any
circumstances—others, that patients were often suffered to die
for want of it. Unfortunately, these points are almost as un-
settled at the present day as at any former period ; and so long
as the constitutions of patients continue to differ, and the circum-
stances favourable, or unfavourable, to their recovery vary, it
will, perhaps, be impossible to lay down definite rules adapted
to every case. Still, however, much may be pointed out as
approaching to certainty, and the rest must be left to the discre-
tion and experience of the surgeon.

The injuries and diseases for which amputation may be
required, may be arranged under the following heads :—1st,
Gun-shot wounds and fractures. 2d, Mortification. 3d, Tumours.
4th, Diseased joints. 5th, Ulcers.

Military surgeons have been often accused of amputating limbs
unnecessarily ; but it should be remembered that after a battle
the wounded are liable to be hurried from post to post, and in
carts or wagons, for days together. Under these circumstances,
the patient would not only suffer immense pain, but his life, in
many instances, be sacrificed. The military surgeon, aware of
this, amputates the limb on the field of battle, or as soon as possible
afterwards, and dresses the stump. Thus situated, the patient
may be moved about, with comparative ease, and with consi-
derable prospect of eventual recovery. In civil life, on the con-
trary, with every convenience and comfort at hand, the removal

of the limb, except in extreme cases, would be considered im-
proper and unjustifiable.   The distinction, therefore, should
always be drawn between the two cases.

In all gun-shot and other wounds, whether accompanied with
fractures or not, the first object of the surgeon should be to
decide at once upon the treatment.   As a general rule it may be
observed, that if the chief arteries of a limb are divided, the
muscles lacerated, and the bones broken, there can be no ques-
tion concerning the propriety of amputation.   On this point all
surgeons of the present day entertain but one opinion.   When
the injury is less extensive, a question will necessarily arise how
far the surgeon may be authorized in risking the patient's life, in
order to save his limb.   This can, of course, only be determined
by the peculiarity of the case ; but experience, or the termina-
tion of former cases, will be the best guide.   If a musket-ball, for
example, pass through the forearm, and the radial and ulnar
arteries escape, amputation will seldom be required.   On the
contrary, if the ball should penetrate the wrist and fracture the
bones, the operation will, in most cases, prove necessary.   Wounds
and fractures of the carpus, metacarpus, and metatarsus, rarely
require amputation ; but similar injuries of the tarsus, or of the
ankle joint, almost invariably terminate unfavourably, unless
amputation be performed.   The same may be said of gun-shot
injuries of the fingers and toes, from which tetanus is extremely
apt to ensue.   When balls lodge deeply in the tibia, when both
bones of the leg are fractured, and their arteries at the same
time are wounded, and when the injury has been inflicted upon
the extremities of the bones, near the knee or ankle joints,
nothing less, in most instances, than amputation will save the
patient.   Gun-shot wounds of the knee, elbow, and shoulder
joints, almost without exception, prove fatal, unless a timely
removal of the limb be resorted to.   Gun-shot fractures of the
thigh bone are so extremely hazardous, that very few patients
recover from them.   Much will depend, however, upon the situa-
tion of the fracture.   If the bone is broken below its middle, the
necessity for amputation will not be so urgent, and perhaps a
cure may take place without this operation.   When the upper
portion of the bone, however, is fractured, recoveries very rarely
follow, owing to the shock communicated to the system, and to

the high fever, and extensive abscesses which form among the muscles of the hip and thigh.

Admitting the above statements, however, to be correct,—and they correspond with the views of the best modern writers,— another question will naturally present itself:—At what period should the operation be performed? On this subject, a great diversity of opinion has prevailed; some contending, that immediate amputation, in the severer injuries, is indispensable; others, that a secondary operation is more likely to be attended by a favourable result. If the weight of authority may be deemed sufficient to settle the question, the number of advocates for immediate amputation, will be found greatly to exceed that of its opponents. Among the former may be enumerated the names of Ledran, Boucher, Ranby, Pott, Schmucker, Mursinna, Boy, Percy, J. Bell, Larrey, Graefe, Guthrie, Thomson, and Hennen —among the latter, Faure, Martiniere, Hunter, and Lombard. When *immediate* amputation, however, is spoken of, it must not be understood that the operation is to be performed instantaneously, or as soon as possible after the injury. On the contrary, it is agreed, upon all hands, that the surgeon should wait until *reaction* takes place, and that, after this, the sooner the operation is performed the better; inasmuch as symptoms of inflammation may afterwards be expected to supervene; and if the operation be performed during this stage, the patient's chance of recovery will be very much diminished. As regards the period at which reaction occurs, after injuries, this will depend altogether upon the extent of the injury, and the peculiarity of the patient's constitution. Some will recover from the shock communicated to the system in an hour or two; others will remain twelve or fifteen hours with a cold skin and feeble pulse. So long, therefore, as these symptoms continue, it may be repeated, the operation must not be undertaken; otherwise, the patient will be apt to die on the table, or a few hours after he is removed from it. Whenever the patient has so far recovered from the injury that his pulse becomes regular, his countenance lively, and he begins to complain of pain and stiffness in the part, this will be the most favourable period for the operation. Provided the operation be performed within forty-eight hours after the injury, it has been customary for military surgeons to denominate it *primary* amputation. On the contrary, when it

is delayed until the symptomatic fever has lessened, and the suppuration is copious, it is called *secondary* amputation.

From what has been stated, it will appear that amputation should be performed in all those cases, where the operation seems to be inevitable, before the accession of inflammation, and as soon as possible after reaction is completely established; but in slighter injuries, such as would seem not imperatively to demand the operation, and under circumstances calculated to favour the patient's recovery, it will become the duty of the surgeon to attempt to save the limb—calculating, if he should be disappointed in his expectation, upon *secondary* amputation as a resource. It should never be forgotten, however, that an operation, performed after the limb has passed through the stages of inflammation, cannot, in general, prove so successful as the primary one, because the muscles, cellular membrane, blood-vessels, and bone, have all taken on more or less disease. Independently of this, secondary amputation, performed upon soldiers who are crowded together in ill-ventilated hospitals, is apt to terminate unfavourably, either from the stump being attacked by hospital gangrene, or from the prevalence of some epidemic disease. But one of the strongest objections that I know of to delay, and which has been particularly pointed out by Mr. Guthrie, is this: " When an amputation," says he, " is delayed from any cause, to the secondary period, a joint is most frequently lost; for instance, if a leg be shattered four inches below the knee, it can frequently be taken off on the field of battle, and the joint saved. Three or four weeks afterwards, the joint will, in all probability, be so much concerned in the disease, that the operation must be performed in the thigh; the same in regard to the forearm and hand, and the upper part of the arm with the shoulder joint. This is a very important point for the consideration of military surgeons, in recommending delay in doubtful cases, as well as the knowledge that amputations in unsound parts are frequently fatal, and are always attended with danger." I might detail numerous cases that have fallen under my own care or notice, in proof of all the foregoing positions relating to amputation as a resource in gunshot injuries; but so many of the kind are detailed in the works of military surgeons, as to render the relation unnecessary.

Mortification, when it attacks the extremities, may require

amputation. But it has long been an established maxim among surgeons, not to operate for this disease during its progress, or until a line of demarcation has been formed, and the dead parts are about to separate from the living—when an amputation will become necessary to form a proper stump, and to remove the bone. If, as experience has proved in innumerable cases, the surgeon were to apply the knife while the disease was advancing, no benefit would result, as the mortification would attack the stump, and continue to increase until it spontaneously ceased, or destroyed the patient. There are certain cases, however, in which it would be proper to deviate from this course, and perform the operation, notwithstanding the progression of the disease. If, for example, gangrene, from a gunshot injury, has seized upon the leg, and is rapidly extending along the thigh towards the body, the patient's chance of recovery will at any rate be small, and under these circumstances, it is possible, though not very probable, that the removal of the thigh may save his life. At all events, the operation should be tried, because it has sometimes proved successful, where death, without it, would speedily have happened. There is another case, also, in which it will be proper not to wait for the line of separation. It is this. A man is shot through the thigh, the femoral artery and vein torn across, and being yet able to walk about, his wound is considered a slight one. About the third or fourth day, however, the toes and foot are found discoloured, and the limb cold and painful. The nature of the disease is then rendered evident, and if not speedily arrested by amputation above the wound, will soon have a fatal termination. For a knowledge of this fact, the profession is particularly indebted to Mr. Guthrie. Notwithstanding the axiom that amputation should not be performed during the progress of mortification in ordinary cases, it is proper to state that Larrey, Hennen, Hutchinson, Lawrence, and some other distinguished surgeons, have long been in the habit of deviating from the rule, and, according to their accounts, with considerable success.

There are many *tumours*, most of which have been noticed in the preceding pages, that may require—if they attain a large size, and seriously affect the patient's constitution—amputation. These are, osteo-sarcoma, spina ventosa, exostosis, and fungus

hæmatodes. The latter disease, as formerly stated, invariably proves fatal, unless arrested by a timely amputation, and, indeed, in many instances, this will not insure the patient's life, even when resorted to in the very commencement. Formerly, many limbs were sacrificed on account of aneurismal tumours, but the improved methods of treating that disease, may be said to have exploded the practice of amputation in such cases.

White swellings, as they are called, when neglected, or improperly treated, by exhausting the patient's constitution through the medium of hectic and diarrhœa, often prove fatal. To remove this constitutional disturbance, and to save the patient's life, amputation, in some instances, will, unfortunately, become necessary; and its benefit is surprisingly evinced upon many occasions, by the rapid amendment of the patient's general health, and early cicatrization of the wound. But there is reason to believe that the operation too often becomes a dernier resource, rather from the mismanagement of the surgeon, than the intractable nature of the complaint.

In civil life, old and inveterate *ulcers of the leg* very frequently call for the removal of the limb; and upon such occasions, the practice of amputation is, perhaps, as justifiable as in most other surgical diseases; for after having, for years, exhausted the resources of his art, the surgeon will find that the constitutional irritation and disturbance will carry off his patient, unless he can eradicate them by laying the axe at the root of the evil. There is one error, however, that an inexperienced surgeon may commit upon these occasions, and which it will be proper to point out. It may happen that an incurable ulcer, accompanied by diseased bone, has existed for years, and has served in bad constitutions, especially the old and debilitated, as an issue or drain, which, so long as it is kept open, tends to appease a cough or some other troublesome symptom. If, under these circumstances, amputation be performed, and the stump heal up, the patient, perhaps, in a short time, recovers his plumpness, and gets apparently well; but in the course of a few months, evident disorder of some of the internal organs, and of the lungs especially, shows itself, and death, in a short time, follows. I have witnessed too many examples of this sort, not to be fully aware of the danger of an amputation, when thus improperly performed. Mr. Guthrie, Dr. Hennen, and some

other writers, notice such consequences, sometimes following secondary amputations, after gun-shot wounds.

The *instruments* and *dressings* required, for most amputations, are two amputating knives, one rather larger than the other, a long and short catling, two or three scalpels and bistouries, the same number of tenacula, artery forceps, needles, ligatures, sponges, a large and small saw, bone nippers, two tourniquets, compresses, rollers, linen retractors, a Malta cross, lint, tow, adhesive straps, lint spread with cerate, two or three basins of warm water, wine and water in a teapot.

Formerly, amputating knives, extremely concave on the cutting edge, were employed. The modern knife is nearly straight, rather short, but substantial in the blade, and rough on the handle, to enable the operator to take a firm hold. The catling is a narrow, two-edged knife, tapering away to a point, and bears a strong resemblance to a dirk. It is intended to pass between bones, and separate the soft parts adhering to them. The amputating saw is about the size of a carpenter's dove-tailed saw, and its handle should also resemble, in most respects, that of the latter. The blade should be thinner as it approaches the back of the instrument, the teeth widely set, and so constructed as to cut with both edges as they are passed backwards and forwards. In using the saw, the surgeon will discover, after a little practice, that the instrument works to the best advantage when moved steadily by long strokes, always taking care to commence by applying the heel of the instrument first to the bone, and drawing thence to the point. When the bone is nearly cut through, the operator should move the saw cautiously and gently, lest the bone suddenly break and leave a projecting point or snag. When this happens, however, it is commonly owing to the assistant not supporting the limb with steadiness. The *bone nippers* are designed to remove the projecting portion of bone, should it break, and are well calculated for the purpose. The handles of this instrument should be longer than they are usually made, and its cutting part placed obliquely upon the shafts. *Retractors* are made of linen, cotton, leather, and sometimes of metal in the form of plates; but the linen are the best. They are formed, by taking a piece of linen, eighteen inches or two feet in length, and a little broader than the stump, and dividing it along the middle ten or twelve inches. The use of

the retractor is to draw up the muscles after they are divided, and prevent them from being torn by the teeth of the saw. The *Malta cross* is formed by sewing two pieces of linen or cotton roller, each about two feet long, across each other at the centre. It serves the purpose of confining the lint or tow upon the front of the stump, and, in this way, assists the roller. A piece of lint, spread with cerate, and large enough to cover the whole stump, will always be found extremely useful in preventing the ends of the ligatures from being glued to the surrounding dressings, by the matter that escapes from the wound. As the patient will have frequent occasion for drink during the operation, and cannot conveniently take it from a tumbler, whilst lying on his back, the spout of a teapot, or some similar vessel, applied to his lips, will be found to answer a better purpose than any thing else.

SECTION I.

AMPUTATION OF THE THIGH.

THE patient being seated on the edge of a strong table, with his back supported by pillows, and assistants on each side to take charge of his hands and arms, the tourniquet is applied by an assistant, about three inches below the groin—a small compress of muslin being previously placed under the frame of the tourniquet, while the pad of the instrument is fixed above the femoral artery. Having ascertained that the circulation of the blood in the limb is interrupted by the pressure of the tourniquet, the surgeon directs an assistant to elevate the leg, and support it nearly in the horizontal position, and then carrying the amputating knife under the limb, until it nearly reaches the side on which he stands, applies it to the thigh as low down as the disease will admit, and with one continued sweep divides, by a circular cut, the integuments, fat, and fascia. The large knife is then exchanged for a scalpel, with which the operator separates the loose cellular membrane connecting the integuments to the muscles, and turns back the skin to the extent of

two inches, in the same way that one would turn back the cuff
of a coat.   Having resumed the amputating knife, and keeping
it close to the rounded margin of the reverted integuments, the
surgeon next cuts through the muscles down to the bone.   In
making this incision, the edge of the knife should be inclined
upwards, in order, as it were, to hollow out the front of the mus-
cles in the form of a cone.   With the scalpel, the surgeon
separates the muscles from the bone for two or three inches,
after which an assistant applies the slit of the retractor around
the bone, twists its ends together, and forcibly pulls the muscles
upwards.   The bone is next divided by the saw, and the limb
removed.   A soft sponge is applied to the surface of the stump,
and the blood being cleared away, the femoral artery, enclosed
by its sheath, and lying near the bone, may be distinctly seen.
With a tenaculum, it is drawn out, separated from its accom-
panying nerve, and tied with a strong round ligature.   The
saphænus major nerve, however, being very small, may escape
observation ; but as it is generally on the front of the artery
and within the sheath, the surgeon should not pass it over, and
include it in the ligature.   After this the assistant slackens the
tourniquet slightly, when a jet of blood will generally be per-
ceived from some of the branches of the profunda and other
arteries.   These vessels must likewise be taken up successively,
until the whole are secured.   But often it happens that the
vessels, from an approach to syncope, retract, and for a time
do not bleed.   The surgeon, aware of this, must not be too
hasty in closing the stump, but should rouse the arterial action
by wine and water, the admission of fresh air into the room,
and solicit, gently, the extremities of the vessels on the stump,
by warm water and the sponge.   As soon as all danger
of secondary hemorrhage is over, the stump may be dressed.
The ligatures being brought out of the upper and lower
corners of the wound, its edges are pressed together by an
assistant, in such a way as to cover completely the extremity
of the bone, and form a cushion for it out of the cut muscles and
integuments.   While thus held, the surgeon carefully wipes the
surface of the skin, for several inches around, so as to render
is perfectly dry and fit to receive the adhesive straps, which are
next warmed and applied—with interspaces of half an inch be-

tween them.*   Over the straps is laid the cerate plaster, and
above the plaster a thin pledget of tow.   This last, in its turn,
is secured by the Malta cross, and the ends of the latter fastened
down by a roller, made to cover by circular turns the whole
thigh, and kept from slipping downwards, by being carried once
or twice around the patient's pelvis.   The tourniquet being ap-
plied loosely about the limb,—that it may be suddenly screwed
in case of secondary hemorrhage,—the patient is put to bed,
laid on his back or side, and the stump is supported by a pillow,
and secured to it by pins and short strips of muslin.   Over the
stump is placed a frame to take off the weight of the bed-
clothes.   If the patient is to lie on his back during the cure, the
edges of the wound should be put together so as to form a per-
pendicular cicatrix, to allow the matter greater facility of drain-
ing off.   On the contrary, should he be confined to his side, the
edges must be approximated in such a way as to effect the same
purpose.   During winter, the dressings may remain on seven or
eight days, but in summer only two or three.   They should be
poulticed three or four hours previously to attempting their re-
moval.   The *after* dressings may be repeated once in forty-eight
hours.   About the tenth day, the ligatures usually come away,
and under favourable circumstances, the wound is healed in
three or four weeks.

To prevent corners from being left, at the upper and lower
angles of the wound, in consequence of the integuments being
puckered in these situations, an inevitable consequence of the
circular incision, as practised in the operation I have just de-
scribed, the late Professor Davidge, of Baltimore, was in the
habit of making his incision through the skin with a common
scalpel, deviating above and below from the circular direction,
and forming an angle which served the purpose of rounding off
the corners.   The operation is somewhat neater than the ordi-
nary one, and possesses an advantage over it as regards the
facility of escape of the matter, which, instead of collecting in a

* To prevent the edges of the skin from uniting by the first intention, and be-
fore the wound closes from the bottom, and thereby to guard against the accumu-
lation of pus beneath the integuments, the late Dr. Physick was in the habit of
sometimes interposing a bit of lint between the lips of the wound, and keeping it
there for a few days.

pocket, formed by the pouting integuments, drains off as soon as secreted. It may be proper to observe, however, that after the stump has *healed*, the corners,—which always exist immediately after the common operation,—disappear, and do not subject the patient to any inconvenience.

The circular operation, above described, is the one practised by the greater number of surgeons in all countries, with more or less modification,—some not attempting to hollow out the muscles by a single sweep of the knife, but dividing them in successive layers, higher and higher as they approach the bone; others by drawing up the skin, and cutting at once through it and the muscles, so as to save the pain and trouble of turning back integuments; and others again depending for a covering to the end of the bone, not upon muscles at all, but upon the integuments alone. All these variations, however, are mere matters of fancy, and may be resorted to, or not, according to the size of the patient's limb, the nature of his disease, and other circumstances; for in general, there is no difficulty, whatever plan may be pursued, in forming a good stump in amputation of the thigh.

There are many surgeons, however, who object altogether to the circular operation, and prefer *flap* amputation in the thigh, as well as other limbs—chiefly upon the ground of its being more expeditious, and less liable to be followed by protrusion of the bone. The mode of executing the operation, also, varies according to the circumstances of the case or the notions of the operator. Some adhere to the original plan of Vermale, and introduce a long dagger-shaped knife, about the centre of the anterior surface of the thigh, transfixing the limb perpendicularly close to the bone, and cutting downwards and outwards several inches, until the knife emerges through the skin, and forms a lateral flap; the knife being again introduced at the original angle of entrance, a similar flap is made on the opposite side, each flap held back by an assistant, the bone sawed through, and the vessels taken up. Liston, and others, however, object to the lateral flaps thus made,—on account of the liability of the end of the bone to rise at the upper angle of the wound, and protrude forwards—and in place of them, form an anterior and posterior flap, by inserting the knife on the *side* of the thigh instead of its anterior surface. I have performed the operation both

ways, and prefer the latter, for the reasons mentioned, which I have ascertained to be well founded—particularly in children— and because the anterior flap by covering the end of the bone gives it support, and prevents necessarily its protrusion. Under most circumstances, however, I am an advocate for the circular operation upon the thigh—inasmuch as there is less danger, in so large a mass of parts, of subsequent purulent collections, and of injury to vessels and nerves by transfixion and oblique division. Many surgeons, indeed, object to flap operations, in toto, upon these grounds ; and it must be confessed with more or less force ; though there are situations where such disadvantages will be more than counterbalanced by the facility of forming a good stump, as will be explained hereafter.

SECTION II.

AMPUTATION OF THE LEG.

As much as possible of the thigh—the advice of some sur-
geons to the contrary, notwithstanding—should, in all cases, be
saved ; but the rule does not always hold good in amputation of
the leg. If, for example, the leg be amputated just above the
ankle, the bone, from the deficiency of surrounding muscle,
cannot be well covered, and is, therefore, not calculated to bear
the pressure of an artificial leg. On this account, the patient
is obliged to have an instrument of the kind adapted to the
knee, and the leg, therefore, is carried out behind at right angles
with the thigh, and by its weight greatly incommodes the patient
—so much so, indeed, that I have known several submit to a
second operation, for no other reason than to get rid of the
incumbrance.

It is usual with surgeons, in amputating the leg, to perform
the common circular operation, when it is desirable to take off
the limb a few inches below the knee, and the *flap* operation
when the leg is removed just above the ankle. I prefer the
latter, however, in all cases. The following is the plan of Sir
Charles Bell :—The tourniquet being placed about the middle of
the thigh, the leg is supported by an assistant holding at the foot,
the surgeon calculates beforehand the quantity of soft parts that
may be required to cover the bone, and passes the common
amputating knife obliquely upwards on the back part of the leg
through the skin, which being drawn up by an assistant, the knife
is next carried along the margin of the divided skin, through the
muscles to the bone, then perpendicularly over the tibia, until it
meets the oblique cut on the other side of the leg. The catling
is next thrust between the bones, and the muscles and interos-
seous membrane divided, a retractor with *three* tails introduced,
the integuments and muscles drawn up, and the bones sawed off.
The arteries being carefully tied, and the nerves excluded from
the ligature, the flap formed out of the muscles and skin is

turned up in front of the bones, and forms over them a thick
cushion, calculated afterwards to bear the pressure of a wooden
leg. In dressing the stump, however,—in the way recommended
for the thigh,—care should be taken not to press the flap too
forcibly against the sharp edges of the tibia—lest ulceration be
excited.

Still better and more expeditious modes, however, of per-
forming the flap operation on the leg are the following:—" When
the right limb is the subject of operation," says Liston, " the
point of the knife* having been entered on the outside, behind
the fibula, is drawn upwards along the posterior border of that
bone, with a gentle sawing motion, for a couple of inches; the
direction of the incision is then changed, the knife being drawn
across the fore part of the limb in a slightly curved direction,
the convexity pointing towards the foot; this incision terminates
on the inner side of the limb, and from this point the knife is
pushed behind the bones and made to emerge near the top of
the first incision; the flap is then completed. All this is done
smoothly and continuously, without once raising the knife from
the limb. The inter-osseous, muscular and ligamentous sub-
stances are cut; the anterior flap is drawn back, and its cellular
connexions divided; both are held out of the way by the hands
of the assistant, and the separation completed with the saw. By
proceeding thus all risk is avoided of entangling the knife with
the bones or betwixt them. In dealing with the left limb the
proceeding is very similar, the internal incision is not made quite
so long; but it should still be practised, for a longitudinal open-
ing of about an inch or more in extent is more easily found in
the transfixion than the mere point at which the anterior incision
is commenced. In sawing the bones of the left leg, the tibia
may safely be cut first, as the surgeon commands the limb during
the process, and can easily obviate the risk of snapping the
fibula. The awkwardness attendant upon a change of position
is thus avoided. Disarticulation of the fibula is not advisable,
owing to the connexion of its head with the bursæ and knee joint.
It is seldom necessary to round off the spine of the tibia."

This mode of amputation is sometimes deviated from by the
same surgeon. When, for example, large, fat subjects meet with

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* Liston's knife resembles a common catling, but is blunt on one edge.

accidents, as there would be an inordinate mass of muscle and cellular tissue, calculated to interfere with the adhesive process, instead of preserving these textures, they are taken away by a circular incision after having formed an anterior and posterior semilunar flap out of the integuments, sufficiently large to cover the ends of the bones. Both these operations I have practised repeatedly; but the former I prefer, either to the common circular operation, like that on the thigh, or to any of the other flap operations I have ever witnessed. Instead of cutting the skin, however, or the anterior part of the tibia on a line with the sawed bone, I generally leave it half an inch longer, in order that it may hang over the sharp edge of the bone, and unite with the corresponding skin from the posterior flap. This prevents the cicatrix from being formed of muscle, which is more or less liable, afterwards, to ulceration from absorption. Many surgeons, indeed, object to the flap operation on the leg and other limbs, altogether, from the liability of the muscular fibres to be absorbed. But, although I have performed a great many operations of the kind, I have seldom found much absorption to take place. On the contrary, the stumps thus made, have preserved for years a full, apple-dumpling-like shape, and have borne admirably the pressure of a wooden leg. I have already remarked that the leg should be amputated high up, on account of the inconvenience of a long protruding stump—much will depend, however, upon the choice, in this respect of the patient; for there are many who would object to the knee resting on a wooden leg, on account of the unsightly appearance of it, and would prefer an expensive machine rather than encounter deformity, or not have the natural appearance of the limb preserved. In such cases the operation may be performed above the ankle. Poor patients, however, make out better when the leg has been amputated as high as possible, or immediately below the tubercle of the tibia. I say nothing here of amputation at the *knee joint* —though it has been performed successfully, and is advocated, under particular circumstances, by Velpeau and other high authorities.

THERE are many cases in which, by removing a part of the foot, the surgeon is enabled to save the leg. Where, for example, the tarsal and metatarsal bones have been crushed by machinery or heavy weights, or rendered carious by frost-bite and other causes, they may be often removed by an operation, in such a way as to preserve the astragulus and os calcis for the patient to rest and walk upon. The operations commonly practised are those of Chopart and of Hey. The first is easily executed. Having applied the tourniquet, the surgeon makes an incision, transversely, two inches below the ankle, through the skin covering the instep. The extensor muscles and their tendons are next divided, and the convexity of the tarsus laid bare. A small longitudinal incision is then made on each side below the malleolus, and terminates at the extremities of the transverse cut. A flap is thus formed which is to be drawn upwards by an assistant. With the bistoury the surgeon next penetrates between the astragulus and scaphoides, and then between the cuboides and os calcis, the ligaments of which being divided, the foot is easily pushed backwards and separated, and a flap formed out of the soft parts beneath the tarsus and metatarsus sufficiently long to be turned up and cover the extremities of the bones. The anterior tibial, and external and internal plantar arteries having been taken up, the flaps are to be held together by adhesive plasters, rollers, and other common dressings. Many surgeons object to Chopart's operation ; but it is so easily performed, and has so often succeeded, as to render the merits of it unquestionable. It is an operation, however, seldom performed by American surgeons,—rather, I apprehend, from their not appreciating the advantages of it than from any other cause. Last winter it was performed before the clinical class of the Philadelphia Hospital, by Dr. Horner ; and recently in Washington, by my friend, Dr. J. F. May, with perfect success, and under circumstances

where the patient would have lost his leg if his case had been submitted to most of our surgeons.

Hey's operation is performed by cutting between the tarsal and metatarsal bones. The place of juncture between these bones is first made manifest by marking with ink across the foot. Half an inch below this mark, a transverse incision is made through the skin and tendons down to the metatarsus. Two horizontal incisions, one on the outer, the other on the inner edge of the foot, commencing at each extremity of the transverse cut, are next made as far as the toes. All the toes are then separated from the metatarsal bones, the muscles and tendons of the sole of the foot turned back from the metatarsus, the four smaller metatarsal bones separated from the tarsus, the first cuneiform bone cut through by the saw, where it projects and supports the great toe, the arteries tied, the flap turned upwards, and connected by sutures to the convexity of the foot, so as to leave an anterior cicatrix, and the operation completed. This operation, although called Hey's, is said to have been executed, successfully, by Turner, of North Yarmouth, in 1787, by Baron Percy, in 1789, and by Hey, in 1799. It is preferred by Dupuytren, Larrey, and some other surgeons, to Chopart's operation. Neither, it must be recollected, should be resorted to indiscriminately, or without due consideration of the state of the patient's constitution,—inasmuch as tetanus or other violent symptoms may follow. Again, it must be borne in mind, that caries, involving the greater number of the bones of the foot, is often incurable by partial operations, and even by amputation of the leg,—which, if performed, will sometimes cause the disease to fall upon vital parts.

The toes occasionally require to be removed—especially the great toe. There are several modes recommended; but the most simple and expeditious is the following. An incision is made along the metatarsal bone to the first phalanx, by a strong, broad bistoury, through the integuments. Having exposed the joint fairly, the point of the knife is dipped into it, the ligaments divided, the blade carried beneath, and used as a lever by which the bone is raised from its bed, and removed by a few strokes of the instrument carried cautiously behind to avoid the anterior tibial artery. In many cases, however, of caries and partial injuries, the cutting forceps of Liston will supersede the neces-

sity of removing an entire phalanx. To remove the smaller toes, either a circular or semilunar incision below the articulation through the integuments, will enable the operator to reach the joint quickly, divide the ligaments and tendon, and remove the bone—leaving sufficient flap to cover, neatly, the cartilaginous extremity of the sound phalanx, or metacarpal bone.

SECTION IV.

AMPUTATION OF THE ARM AND ELBOW.

WHEN it becomes necessary to amputate the arm, the patient should sit on a chair, or lie over the edge of a table or bed, and while the limb is carried out at right angles from the body, and supported by an assistant, a circular incision is made through the skin and muscles,—according to the directions already given when treating of amputation of the thigh, with exception of not dissecting back the integuments,—the bone sawed off, the vessels secured, and the dressings applied. If the operation is performed about the middle or lower part of the arm, the tourniquet may be applied above; but when it becomes necessary to amputate very high up, there will be no space left for this instrument, and the surgeon must then trust to compression of the subclavian artery, where it passes over the first rib. Under these circumstances, Larrey and some other surgeons advise the amputation of the arm at the shoulder joint; but I should prefer making a flap out of the deltoid muscle, and with this covering the extremity of the bone. If the flap operation should be preferred, it may easily be done by transfixing the arm close to the bone by the catling, and making anterior and posterior flaps, which being forcibly drawn up by an assistant, the bone is cut off with a narrow saw, the vessels tied up, and ordinary dressings put on. The longer the stump the better, as it affords more purchase, and is better adapted to an artificial arm, which is easily made, and not only well adapted to obviate deformity, but to execute many useful offices.

Where there is much doubt of the possibility of saving the

forearm after extensive injuries, rather than remove unnecessarily any part of the arm, Dupuytren revived and executed the bold expedient of amputating at the elbow joint. His example was soon followed by others, and now many cases have been reported of the successful termination of such operations. There are two or three modes of conducting the operation; but the following is perhaps as simple and effectual as any other. The surgeon bends the forearm slightly, and passes a catling transversely from one condyle to the other, under the bellies of the flexor and supinator muscles, and cutting towards the surface, makes a semilunar flap. This being turned back, the lateral and capsular ligaments are divided, the olecranon either turned out, or removed by the saw, the radial and ulnar arteries secured, and the operation finished, by covering the extremity of the humerus with the fleshy flap, and keeping it in its place by long strips of adhesive plaster.

SECTION V.

AMPUTATION OF THE FOREARM.

NOTWITHSTANDING the importance of saving as much as possible of the forearm, it is difficult to raise sufficient muscle and integument to cover the bones, when the operation is performed near the wrist. Still the surgeon should not, I conceive, be governed by the declaration of Liston—that "amputation of the forearm should not be attempted below its middle." So far from it, I have succeeded, in several instances, both in circular and flat operations, in covering the bones completely, by carefully dissecting up the skin and muscles, to a greater extent than usually practised, and by taking especial care to separate the ends of the tendons in such a way as to keep them on a level, instead of leaving some long and others short, as too often happens. If the circular operation be determined on, the tourniquet is applied above the elbow; a strong assistant then secures the forearm, by grasping, with one hand, the elbow, and with the other, the patient's hand; while the surgeon makes

with a large scalpel, or catling, a cut through the skin all round
as deep as the fascia.   The integument is next reverted to the
necessary extent, and the catling passed through the muscles
and interosseous membrane, which are to be separated from
the bones externally, and forced upwards by retractors ; and
while thus kept out of the way, the bones may be divided by
the saw, together, instead of separately ; to effect which, advan-
tageously, the forearm should be held in a state of extreme
pronation.   After this, the radial, ulnar, and interosseous arteries
are secured, the bones buried, as deeply as possible, in the
muscles, and the skin drawn over and retained by the ordinary
dressings.

The flap operation, however, is performed in amputation of
the forearm by most surgeons.   It may be either single or
double.   In general, two semilunar flaps are made by transfixing
the muscles anteriorly and posteriorly to the bones, by a catling,
which is made to cut its way outwards.   In this way, I have
made better stumps, than when I have trusted to a single flap—
which is apt to be thick and dumpy, and not lay so well over
the extremities of the bones.   The chief objection made by
surgeons to the flap operation on the forearm, is the liability to
wound the arteries higher up by the sweep of the bistoury than
is intended.   Cases of secondary hemorrhage from this cause,
have been reported.   In any of these operations, should the
nerves be found hanging loose in the wound, or between the
interstices of the muscles, they should be shortened, to prevent
neuroma or spasms, after adhesion of the stump has taken
place.

SECTION VI.

AMPUTATION OF THE HAND.

It is seldom necessary to remove the hand at the radio-
carpal articulation.   Where, however, the carpus, metacarpus
and fingers have been torn to pieces by the bursting of a gun,
crushed by heavy weights, or reduced to atoms by machinery,

rather than sacrifice a part of the forearm, it will be better to remove the injured parts at the wrist. Like other amputations of the kind, the circular or flap operation may be performed. To execute the former, an assistant should draw up the integuments and hold them tense, while the surgeon, with a bistoury or scalpel, divides them circularly an inch or more, below the extremities of the radius and ulna. Without dissection, the skin may, generally, be turned back, sufficiently high to expose the joint, when the tendons and ligaments may be cut through behind the carpal bones, and the hand separated. Or if these bones are uninjured they may be preserved, inasmuch as some of them, particularly the pisiform, serve as fixed points for the insertion of muscles. The radial and ulnar arteries require to be secured, and sometimes the interosseous. Care should be taken to exclude the nerves.

The flap operation may be either single or double. The latter is preferred by Lisfranc, Liston, and most other surgeons; and is very conveniently and rapidly performed by making a semilunar incision with a sharp pointed knife over the back part of the wrist, turning up the integuments, opening the joint by division of the lateral ligaments, and forming another and larger flap on the palm of the hand.

The fingers, from injuries, paronychia, and other diseases, may require to be removed at the metacarpo-phalangeal articulation. There are several modes of effecting it, but either of the following—recommended by Liston—may be safely and quickly executed. "An incision is made on the radial or ulnar side of the joint, as may be, over the prominence of the knuckle, and in a semilunar form, the convexity being forwards. The finger having been inclined to the opposite side, and the point of the narrow bistoury entered into the joint, the capsular and lateral ligaments, as also the extensor tendon, are cut, and the head of the bone turned out; the blade of the knife is then placed behind it, and the part is removed by the formation of a similar and corresponding flap on the opposite side. Or an incision is at once made of an oval form from the point above indicated, completely round the joint, terminating where it began; the tendons and ligaments are then cut, and the part detached. In either way very similar flaps are formed. The end of the incision on the dorsum of the hand may be put

together with a point of suture, or by plaster; and the oozing having ceased, the farther apposition and retention of the surfaces are effected sufficiently, by tying together the ends of the neighbouring fingers with a bit of tape or bandage. The hand is elevated, kept dry and uncovered; and if, after a few days, discharge should appear, the parts are made clean and the warm water dressing applied."

The phalanges of the thumb and fingers are easily removed by making a circular, or semilunar incision through the integuments below the joint, dividing the ligaments and tendons, turning out the heads of the bones, covering the cartilaginous extremities of those left, by the flaps formed. To remove the metacarpal bone of the thumb from the trapezium, a narrow bistoury may be passed through the fleshy substance between the thumb and fore-finger, composed of the adductors indicis and pollicis, as high as the articulation, which is then opened and the head of the metacarpal bone turned out; or as advised by Liston, an incision may be made over the back of the metacarpal bone three-fourths of an inch above the joint, the knife carried along the line of the bone, down to the fold of integument between the fore-finger and thumb, made to enter at this point, and to emerge at the commencement of the incision. In all operations about the hand, where it can be done without risking too much the patient's life, by tetanus, an attempt should always be made to save, at any rate, one or more fingers; as the patient will find them, even when mutilated, extremely useful—much more so, indeed, than the most ingeniously contrived artificial means ever devised.

SECTION VII.

AMPUTATION AT THE SHOULDER.

By a cannon-shot, the head of the os humeri is sometimes carried away, or the bone so shattered as to render amputation at the shoulder joint necessary. The same may be said of fracture from a bullet or grape-shot. Various tumours, also, such as fungus hæmatodes, osteo-sarcoma, exostosis, and caries, may give rise to this operation, which was formerly looked upon, under any circumstances, as hazardous in the extreme. The experience, however, of modern surgeons, tends to prove its perfect safety as well as simplicity. There are various modes of performing the operation; but the old plan of La Faye, as modified by later operators, should, I think, in most cases, be preferred. It is executed in the following way :—

The patient is seated on a chair, whilst an assistant, standing behind him, presses on the subclavian artery, where it passes over the first rib, by a boot hook, or large key, covered with a firm linen compress. A semicircular incision, with its convexity downwards, is then made, transversely, with a large scalpel, through the integument and deltoid muscle to the bone, three or four inches below the acromion process. This flap being turned upwards, the tendon of the long head of the biceps is exposed and divided, the capsule of the joint opened, and the head of the bone turned out of its glenoid cavity. As soon as this is accomplished, the soft parts beneath the arm are cut through, at a single stroke of the knife, the arm separated from the body, and the axillary artery instantly picked out by the tenaculum and tied. Any other vessels that may bleed being secured, in like manner, the edges of the wound are brought together, and dressed in the ordinary way. But it sometimes happens that the deltoid is shot away, and of course the surgeon cannot depend upon it for a flap. In that case the glenoid cavity may be covered by the muscles on the sides or under part of the arm, or the flap may be made of integuments, or

muscle, from whatever situation the surgeon can obtain it. For complicated injuries, therefore, about the shoulder joint, it is absurd to lay down any systematic plan of performing the operation. I have twice, only, found it necessary to amputate at the shoulder joint.

In certain cases it may be possible to save the patient's arm, notwithstanding a gun-shot wound and fracture of the head of the humerus—by laying open the joint immediately after the injury, and removing the fragments of bone, or by waiting until suppuration is established, and the shattered pieces become loose. An operation of the kind, however, can only be depended upon when the fracture is comparatively limited, and the shaft of the bone not splintered. White, of Manchester, Bent, of Newcastle, Baron Larrey, Mr. Guthrie, and other surgeons, have repeatedly succeeded, under these circumstances, in preserving the limb, and saving the patient's life. Sometimes it may become necessary to remove the scapula—as proved by Walther, Haymann, and others.

SECTION VIII.

AMPUTATION AT THE HIP.

Rude and fearless as the older surgeons were in their operations, they admitted, very reluctantly, the occasional necessity of *quartering* a patient. Morand, Puthod, and Volner, in 1737, brought the question before the Royal Academy of Surgery at Paris. Ravaton in 1743, and L. Aloutte in 1748, proposed the same thing; in 1756, it was made the subject of a prize essay, by the Academy ; and in 1759, an essay of Barbet, received the sanction of that learned body. From that period, numerous essays appeared on the subject, in most of which, the operation was advocated. But the French, notwithstanding their disquisitions, were not the first, it seems, to execute the operation. The English, at least, claim the first operation of the kind, for one of their countrymen—Mr. H. Thomson of the London Hospital. The second operation was, also, performed in England,

by Mr. Kerr, of Northampton, in a case of hip joint disease. Both proved fatal; and it was reserved, at last, for Perrault, of France, to establish for himself, in 1774, the claim of being the first *successful* operator. About the same period, Perret, another French surgeon, was equally successful.* From that time little attention seems to have been paid to the subject, until the commencement of the present century, when the French army surgeons, impressed with the importance of giving the operation a trial, in certain hopeless cases of gun-shot injury, revived the practice. To Larrey, above most others, the credit is due, of pointing out the cases, and of performing the operation, under circumstances most likely to be followed by success. These are, extensive wounds and fractures of the head and neck of the femur, from gun-shot, cannon-balls and shells, laceration of the principal vessels and nerves of the part, or entire separation of the limb, so high up as not to admit of the usual thigh operation—as well as gangrene from gun-shot and other violence. It must be understood, however, that such injuries and disease, should be confined to the thigh, and not involve the pelvis, abdomen, or other parts of the body; otherwise the chance of success will be very much diminished. From the result of fortunate cases of this description, in the hands of army surgeons, the hip amputation has, also, been extended by surgeons in civil life, to necrosis, osteo-sarcoma, exostosis, and other tumours and diseases, involving *merely* the thigh, as in the cases operated on successfully, and reported by Sir Astley Cooper, Mayo, Guthrie, Orton, Mott, Bryce, Delpech, Wedemeyer and others. As to imitating the example of Kerr, of Northampton, and amputating at the hip joint, in cases of *morbus coxarius*, no surgeon acquainted with the pathology of that affection,—in nine cases out of ten, a constitutional disease which extends to the abdomen and pelvis,—would seriously think, for one moment, of such an experiment. In Kerr's case, the acetabulum and ossa innominata, were carious. The patient, a girl of eleven or twelve years of age, was also consumptive; yet lived eighteen days after the operation! In 1812, Baffos amputated the hip of a scrophulous child, nine years of age, who lived three months after the operation. Upon dissection, the acetabulum was found

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* See Cooper's Dict. of Surg. London, 1838.

filled with fungus, and the innominatum with carious. Upon a child—said to labour under coxalgia—amputation at the hip was performed in the winter of 1840, in this city, by Dr. Duffy, assisted by Drs. J. K. Mitchell, Condie, and others, and so far, we are told, with apparent success. *" Nous verrons."*

Upon the whole, as regards this amputation, both in favourable and unfavourable cases, it is proper to state, that it has *failed* in by far the greater number of instances, that about *twenty-two successful* cases have been reported within the last twelve years, and that under *auspicious* circumstances, or where the patient's chance of recovery, without such expedient, is *hopeless*, the surgeon will be justified in resorting to the measure.

As regards the operation itself, which I have never performed on the living body,—though I have had many chances so to do,—it cannot be considered difficult for the surgeon, however terrific and formidable it may prove to the patient. Like most other amputations, too, there are numerous modes of executing it. These I need not describe,—as they may be found in all the Systems of Operative Surgery,—with exception of the mode I should now prefer, were I to undertake the operation,—that recommended by Liston, in which anterior and posterior flaps are formed. " The patient is placed on a firm table, with the nates projecting a little beyond its edge. The sound limb may be secured to the foot of the table with a towel; all occasion for an assistant to hold it being thus done away with, and more freedom afforded to the operator in his movements. The other limb is supported by one assistant, while another presses with one or both thumbs on the femoral artery, where it passes over the pubes. Transfixion is then performed horizontally, the knife passing in a somewhat semicircular direction, so as to include as much of the soft parts as possible, and an anterior flap is made by cutting downwards. During the passage of the knife across the joint, the assistant holding the limb, rotates the limb, if it be the right one, a little outwards, or if it be the left, in the contrary direction, so as to facilitate the bringing of the point of the knife through the skin well inwards. After the formation of the flap, the assistant abducts the limb forcibly, and depresses it; the joint is opened; the round ligament cut; the rest of the capsule divided; the blade of the knife placed behind the great trochanter; and the posterior flap quickly formed. After trans-

fixion for the anterior flap, and when the sawing motion of the knife has made a little advance, the compressing assistant shifts his hands into the incision, immediately behind the back of the knife, and thus obtains a firm grasp of the femoral artery previously to its division. He retains this hold during the rest of the operation, at the same time retracting the flap. As soon as the limb is off, the bleeding vessels in the posterior flap are compressed and tied as quickly as possible. Lastly, the femoral artery is secured, which, while the assistant retains his hold of it, will not bleed."* Next to this flap operation I should prefer the common circular amputation, as near the joint as possible—leaving integument and muscle enough to cover well the joint. Abernethy always commended this mode in his lectures; and it was the one pursued, I believe, by Dr. Mott, who, in the case operated on by him, found it very easy to pick out the head of the bone from the acetabulum, after the incisions were made through the integuments and muscles around the joint.

SECTION IX.

CONCLUDING REMARKS ON AMPUTATION.

AMPUTATIONS, however modified, are among the easiest operations the surgeon is called upon to execute. Hence it too often happens that they are the first exploits of the young and inexperienced; who, intent upon the eclat to be derived from what they consider a brilliant exhibition of dexterity and skill, are sometimes apt to overlook the actual necessity for removal of the part; or at least do not always make very strenuous efforts to save by less painful means, what they can so easily accomplish by a few flourishes of the knife—though at the expense of the unfortunate patient. I believe there are few old surgeons but are willing to acknowledge they have committed such mistakes; and candour compels me to say that, no doubt, I myself am entitled to a full share of censure for precipitancy of the kind. Let it be understood, then, that it is much easier to per-

* See Liston's Elements of Surgery.

form the operation than to determine when it is necessary, and that the surgeon, in reality, acquires more lasting reputation by saving one limb than by cutting off twenty.

It has become fashionable, within the last few years, to dispense, as much as possible, with the *tourniquet*, and to trust to one's own fingers or those of assistants. This amounts, in many instances, I have observed, to affectation, or a desire to be thought ambidextrous, or more supple about the joints than one's neighbours. It is poor consolation, however, after a patient has bled to death, to say to his friends, that the surgeon acted *secundum artem*, or upon high authority, in deviating from the beaten track. Several such cases have occurred from the alarm or thoughtlessness of assistants, or from the agitation or awkwardness of the surgeons themselves. Let the young surgeon, therefore, not neglect to have suitable compressing machines about him, to be applied at a moment's warning, should one break; and never to forget that with a common handkerchief and stick, he can always make, instantly, a "*Spanish Windlass,*" which upon being twisted on a limb will effectually stop any hemorrhage he may encounter. Guthrie acknowledges he once lost an officer, from mismanagement of the tourniquet by an assistant. As far as possible, then, the surgeon should control his own tourniquet, or watch the fingers of his assistants, in situations where a tourniquet cannot be used.

Some modern surgeons, in order to be singular, no doubt, decry *retractors*. Were they of no further use, however, than to keep the soft parts from the action of the saw, this argument in their favour would be sufficiently valid. Who has not seen muscular fibres torn to shreds and tatters by the saw in the midst of a rapid and bungling operation? Independently of this consideration, they are really useful in drawing up the soft parts so far as to enable the surgeon to save covering enough for his stump; for want of which so many protruded bones and sugar-loaf stumps are formed.

There are many persons who use the *knife* with sufficient expertness, and make bold, clean, and sweeping cuts; but who are so awkward and ungainly with the *saw*, as to make it hitch and titter, or get it immoveably wedged in the furrow. This arises, too often, from the force and weight put upon it, or upon the manner in which some booby of an assistant holds the limb.

The proper corrective for the first error is to *practice* with a common dove-tail or tenant saw upon *wood*, by which the surgeon will soon learn that to handle such an instrument properly, he must hold it steadily, and make it work lightly, and the moment he discovers it to be wedged, instead of driving it by main force through the obstruction, that he should ease off, and, if necessary, withdraw it, and see that the assistant gets the limb straight; for an angle being formed in the bone by bending of the limb, is the most common cause of entanglement of the teeth.   Much mischief, also, is not unfrequently done by rasping the bone, and removal of the periosteum before the saw is applied.

Most surgeons in England and this country, aim at union by the first intention, and think the sooner they can close the edges of the wound the better.   The French and continental surgeons, on the contrary, generally run into the opposite extreme, and keep it open too long.   It is best to observe a medium, and to interpose a bit of lint, whenever the lips of the wound appear to be closing too rapidly ; otherwise abscesses and ulceration are apt to follow.   Some limbs, too, in order that the wound heal in due time, and the bone be prevented from protruding, require to be supported with rollers and firm dressings, —instead of being covered with watery dressings, and left unsupported.   Great mischief, also, results, in many cases, from the manner of *undressing* the stump, and the slovenly way of securing the dressings ; which should always be put on by the surgeon himself, instead of being left to a pupil, or to one of *his* assistants, or ward-nurses.

Ligatures are often suffered to remain too long in the wound. On the contrary, attempts to jerk them away, prematurely, independently of the pain created, may give rise to secondary hemorrhage.   The best plan, when they hold their place tenaciously, and show no disposition to come away, is to put them on the *stretch*, by forming a kind of bridge out of a compress, attaching another string to the ligature, fixing it securely at a distance, and suffering it to be *strained* upon by crossing the compress or bridge.   This plan I always supposed to have originated with Dr. Physick ; but when last in Europe, I discovered it to be a common practice, and was told it had been so from time immemorial.   I might add other suggestions for

the benefit of the young surgeon; but shall conclude by append-
ing a summary of statistics, in relation to amputation in this
country, which I think will be read with interest.

The attention of surgeons has latterly been directed to the
subject of the mortality following amputations. In the numbers
of the American Journal of Medical Sciences, for August, 1838,
and May, 1840, a statistical account of the amputations per-
formed in the Pennsylvania Hospital, during the ten years from
1830 to 1840, has been given by Dr. Norris, surgeon to the
Institution, from which it appears, that

Of eighty amputations on seventy-nine patients, thirty-five
were primary, of which twenty-four were cured, and eleven
died, four of the deaths occurring within twenty-four hours
immediately following it.

Twenty were secondary, of which thirteen were cured, and
seven died.

Twenty-five* were for the cure of chronic affections, of
which twenty were cured, and four died.

Thirty-two of the amputations were of the upper extremity,
of which twenty-seven were cured, and five died.

Forty-seven were of the lower extremity, of which thirty-one
were cured, and sixteen died.

Seven were amputations at the joints, of which four were
cured, and three died.

13 of the 79 operated on,	were under 20 years of age,	12 were cured, and 1 died.
26 "	were between 20 and 30,	19 "	7 "
22 "	" 30 and 40,	15 "	7 "
16 "	" 40 and 50,	9 "	7 "
2 "	were upwards of 50,	2 "	0 "
—		—	—
79		57	22

The conclusions drawn by Dr. Norris from an analysis of his
tables are:

1. That amputation† with us is to be regarded as an opera-

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* One double.

† The *great* amputations only, it will be recollected, are alluded to; no death
has followed any of the amputations of fingers or toes, which have been made in
the hospital, during ten years.

tion attended with much danger to the life of the individual, the mortality after it being 1 in $3\frac{7}{11}$.

2. That the chances of success after it, are much greater in persons who have been for some time suffering from chronic diseases, than in those who have it done while enjoying robust health, the mortality in the former class of cases being 1 in $6\frac{1}{4}$, while in the latter it is 1 in $3\frac{2}{11}$.

3. That immediate amputations after injuries are less fatal than secondary amputations, the mortality after the former, being 1 in $3\frac{2}{11}$, while in the latter, it is 1 in $2\frac{6}{7}$.

4. That amputation of the lower extremity is much more fatal than the superior member, the mortality after the former, being 1 in $2\frac{15}{16}$, while in the last mentioned class of cases, it is only 1 in $6\frac{2}{5}$, and

5. That the danger increases with the age of the individual operated on.

"That the success of amputations is greater in small towns and country practice," observes Dr. Norris, "or even in the private practice of large cities, I firmly believe. In the small hospitals of cities, too, in which but a few surgical patients are collected together, the success after amputations may probably be greater than with us, though, in order to arrive at any thing like a true average of the mortality attendant upon the operations in any one institution, observations carried through a series of years will be necessary. This necessity of extending any observations that may be made through a term of years, is strikingly shown by an inspection of the tables which I have made; in some years the mortality after these operations being very small, while in others, though a similar class of cases have come under notice, and been subjected in every way to similar influences and treatment, the mortality has been large. From the 1st of January, 1830, to the 1st of January, 1832, but one death took place out of eleven amputations made during that period, while from the 1st of January, 1832, to the 1st of January, 1834, one-half of those amputated died, (seven out of fourteen,) and in the next succeeding two years the mortality became still greater, eight out of fifteen, terminating fatally. From 1836 to 1838, the mortality then strikingly decreased, the loss being only one-third, (five out of fifteen,) and by the accompanying table it will be seen that,

from the 1st of January, 1838, to the 1st of January, 1840, there has been but a single death out of twenty-four amputations, seventeen successive operations having had a favourable termination. To assert that death after amputation is rare with us, would be warranted by the experience of the past two years, though undoubtedly it would be as far from giving a true idea of the danger of the operation, or of our average success, as to aver our ordinary results to be such as were had between the years 1834 and 1836."

In the same journal may be found other statistical tables on the subject, by Dr. Hayward, of Boston, going to show that in the Massachusetts General Hospital,—a much smaller institution,—the mortality is a fraction less than that given in the tables of Dr. Norris. From Professor Warren, of Boston, I learn that he has performed the operation of amputation in hospital practice about *forty times*, and that three-fourths of the cases proved successful; that in private practice he has operated eighteen times, and saved all except one. The number of my own operations, I have no means at this moment of ascertaining precisely, but having been for the last twenty years surgeon to the Philadelphia Hospital, an institution much larger than any other in the United States, and all my life, previously, connected with other hospitals, I think myself very safe in affirming that I must have amputated, in the course of my career, upwards of a hundred times, and yet I can hardly call to mind more than six or eight cases that proved unsuccessful.

On Amputation, consult Pott's Works, vol. iii. ; Hey's Practical Observations, 3d edit. ; Desault's Works, by Smith, vol. i. ; J. Bell's Principles of Surgery, vol. i. ; Larrey's Memoirs ; C. Bell's Operative Surgery, vol. ii. ; Guthrie on Gun-shot Wounds of the Extremities ; Thomson's Report of Observations made in Military Hospitals in Belgium, &c. ; Pelletan, Clinique Chirurgicale, tom. iii. ; Hennen's Principles of Military Surgery, 2d edit. ; Coster's Manual of Surgical Operations, by Godman, 1825 ; Liston's Elements of Surgery ; Liston's Practical Surgery, 1838 ; Article Amputation, in Dictionnaire des Sciences Medicales, tom i. ; Velpeau, Nouv. Elem. de Med. Operat., Paris, 1838 ; Cycloped. of Pract. Med. and Surg., by J. Hays, Art. Amputation ; Averill's Operative Surgery ; Guthrie on Gun-shot Wounds ; Maingault, Med. Operat., fol., Paris, 1824 ; J. F. Malgaigne, Man. de Med. Operat. ; Dupuytren, Leçons Orales, tom. iv ; Cooper's Dictionary of Surgery, 7th edit. London, 1838.

CHAPTER XVII.

HYSTEROTOMY, OR CÆSAREAN SECTION.

IN cases of extraordinary diminution, or deformity, of the pelvis—of exostosis, and other tumours within its cavity—of fractures of the innominata and sacrum, followed by irregularity of reunion or profusion of callus—of dislocations of one or both thigh bones—of wounds of the uterus—of extraordinary size of the fœtal cranium—of fœtal monstrosity—of hernia of the uterus—of preternatural presentation of the fœtus—of rupture of the uterus—of obliquity of the uterus—of large stones in the bladder—of strictures and adhesions in the vagina—of enlargement of ovaries—of extra-uterine conceptions, and other diseases, accidents, malformations or death of the mother, it may become necessary to lay open the parietes of the abdomen, divide the peritoneum, cut into the womb, and remove the child. From the earliest periods the operation has been resorted to, with more or less success, in some countries, and in others with total failure. Thus, in Great Britain, although performed between thirty and forty times, there is but a single instance* in which both mother and child have been saved, and very few, where the life of the infant alone has been preserved. In France, Germany, and some other parts of the continent, however, the operation has frequently proved successful, and has been repeated on the same patient with similar result. Indeed, out of two hundred and thirty-one operations reported, one hundred and thirty-nine are said to have been followed by partial, or

* Lately by Mr. Knowles of Birmingham.

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complete, success. That the operation has been attempted, by surgeons, two or three times in the United States, there is reason to believe; but in no instance has the life of mother and child, so far as my information extends, been saved, except in the cases I shall now relate.

Mary R——d, wife of Joshua M. R——d, Esq., of this city, twenty-six years of age, was married the 16th of May, 1830, and on the 14th of June, 1831, was in labour with her first child. Dr. George Fox, being called to her assistance, found the os uteri sufficiently dilated to admit a finger, and feel the protruding membrane. Discovering a few hours afterwards, great deformity of the pelvis, he was led to believe that Mrs. R. could not be delivered per vias naturales, and therefore requested the assistance of Professor James, and subsequently that of Drs. Meigs, Lukens, Hewson and J. R. Barton. After repeated, and most accurate examination, it was concluded that the antero-posterior diameter of the pelvis did not exceed two inches; and it then became a question whether the division of the symphysis pubis, the Cæsarean operation, or embryotomy, should be performed. " The Cæsarean operation was thought to be attended with so much risk to the mother as almost to be necessarily fatal, some of the most distinguished surgeons being decidedly opposed to its performance; and Dr. Physick, who was called upon for his opinion on the propriety of this operation, was decided, and positive in his opposition to it. Under the weight of such authority, the idea of the Cæsarean operation was abandoned."* It was then determined to perform cephalotomy, and Dr. Meigs agreed to undertake it. Before he commenced that operation, however, Dr. M., conceiving, after further examination, that " cephalotomy would be attended with as much risk to the life of the mother as the Cæsarean operation, thought it better to call another consultation, to reconsider the propriety of performing the Cæsarean operation."† During this consultation it was decided that the child was dead; there being, therefore, " no further hesitation as to the propriety of cephalotomy," that operation was commenced immediately by Dr. Meigs, and performed in the most

* Relation of a Case of Labour, in a Female with Deformed Pelvis, by George Fox, M. D., in North American Medical and Surgical Journal, No. xxiv. October, 1831, p. 485.

† Ibid.

skilful manner, and the patient, (notwithstanding the great diffi-
culties the operator had to encounter,) recovered in three weeks
after delivery, though she had almost fallen a victim to ex-
haustion.*

On the 22d of June, 1833, Mrs. R.'s labour with her *second*
child commenced. Dr. Meigs was again called to her assist-
ance, and performed a second time the operation of cephalotomy
—having previously ascertained that Cæsarean section would
not be submitted to. The patient again recovered, and with less
difficulty than after the first operation.

In June, 1834, Mrs. R——d became pregnant with her third
child, and Dr. Jos. G. Nancrede was consulted, and after ma-
ture deliberation decided, that Cæsarean section was the only
appropriate operation in her case, inasmuch as it had been per-
formed on the continent of Europe, in several instances, with
success, and was considered by the most eminent accoucheurs
not more hazardous, under certain circumstances, than embryo-
tomy. Upon these and other grounds, Dr. Nancrede determined
to use his influence with the patient, and her friends, to induce
them to consent to the operation, and requested me to make
every preparation for its performance—in case I approved of
and was willing to undertake it. Coinciding with him in senti-
ment, and having considerable time for reflection, and opportu-
nity of examining authorities as to the best mode of performing
the operation, I made all the necessary arrangements.

On Wednesday, the 25th of March, 1835, I received notice that
Mrs. R—— was in labour ; and at 3 o'clock, P. M. saw her, for
the first time, with Drs. Nancrede and F. S. Beattie. Labour
had commenced the night before, though the pains during that
night, and the whole of Wednesday, were slight. The os uteri
however, had dilated sufficiently to admit two or three fingers,
but the membranes remained entire. In this state of affairs it
was explained to Mrs. R——, by Dr. Nancrede, and the Rev.
Mr. Hughes, her pastor, that it was deemed improper, in every
point of view, to destroy her child, and that it was her duty to
risk her own life in the hope of saving that of her offspring.
After consulting for some time with her husband, and other

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* Meigs on Deformed Pelvis, &c., in Baltimore Medical and Surgical Journal
and Review, vol. ii. p. 30.

friends, she consented to have the operation of Cæsarean section performed.* A firm table was selected, and covered with a mattress and sheets, the patient placed upon it, on her back, and her pelvis and shoulders supported by pillows. In presence of Dr. Nancrede, Professor Dewees, Dr. Dove, of Richmond, Professor Horner, Dr. Beattie, Dr. Wm. Coxe, Dr. Theodore Dewees, and my son, Dr. Charles Bell Gibson, I made an incision at the centre of the linea alba, commencing about an inch below the umbilicus, through the integuments, and extending nearly to the pubes. To save the patient pain and to prevent this first, or perpendicular, cut from penetrating too deeply, I requested Dr. Horner to fold up the skin with his fingers, and while thus held I passed the knife through it with its back towards the abdomen. The superficial fascia being exposed was divided, then the tendons of the abdominal muscles next the peritoneum, and lastly the body of the uterus, all to the extent of six inches. The uterus, however, at this stage of the operation, was not cut entirely through, but a line or two in thickness, of the interior of its walls, left—with the view of drawing off the waters before I opened the womb, penetrated the membranes and exposed the child. At my request, Dr. Nancrede introduced a finger into the os uteri and endeavoured to rupture the membranes but did not succeed. A similar attempt was made by Dr. Beattie, which also failed. Having resumed the knife, the remaining fibres of the uterus were divided, the membranes exposed, and cautiously opened by running Cooper's bistoury for strangulated hernia, upwards and downwards, to the extent of six inches, while Dr. Horner held closely together the sides of the wound, to prevent protrusion of the intestines and the escape of any portion of the waters into the bag of the peritoneum.

There was a right lateral obliquity of the uterus, and the position of the child found to correspond with the third breech presentation of Baudelocque. Dr. Beattie then introduced his hand, and drew out the feet, while Dr. Nancrede supported the hips and back, and removed the body, and lastly, the head of the child, from the womb. It proved a girl of large size, and

* There are several modes of performing Cæsarean section, but I prefer the one I have here described.

apparently healthy. For some seconds, however, it did not breathe, and indeed, not until friction on the chest, blowing into the mouth, and the introduction of a few drops of brandy were resorted to. The cord being cut, the child (Maria Cæsareana) was removed, and in a short time cried lustily. Whilst Dr. Horner still kept the sides of the wound together, Dr. Beattie extracted, without difficulty, the placenta and membranes, and, at the same time, pushed a finger from the interior of the uterus through the os tincæ, to make a free communication with the vagina. During these manipulations, two portions of intestine, each the size of a pigeon's egg, protruded on the right side of the uterus, and near the upper corner of the wound. They were readily kept back, however, and did not again protrude; nor did any fluid, so far as could be observed, find its way into the peritoneal bag. No hemorrhage took place from the removal of the placenta, nor was it necessary to secure a single vessel with the ligature. There was a visible contraction of the womb, after the removal of its contents, and the incision in it had sensibly shortened in the course of a few seconds.

My attention was next drawn towards closure of the wound. With great care, and the utmost nicety, the edges of the peritoneum, muscles, and integuments were held together by assistants, while I passed, successfully, three stout silk ligatures, in form of interrupted suture, through the integuments—avoiding the peritoneum and muscles—an inch and a half from each other, and supported the whole by adhesive straps, lint, a compress and roller, around the abdomen. To give vent to any secretion of serum, or pus, the lower angle of the wound was left open for the space of half an inch. The patient was then raised very carefully, by several assistants, and laid in bed upon her back and great pains taken to render her position as comfortable as possible, and to prevent the slightest movement. There was less difficulty in this respect than could have been anticipated, arising partly from the little pain, comparatively, during the operation, the natural firmness and equanimity of the patient, and her faithful reliance upon Providence for a happy issue out of her affliction. Under the cheering influence of such feelings, she slept soundly for several hours, and did not change her position in the slightest degree.

By Drs. Nancrede, Beattie and myself,* she was visited, for a week or ten days, three times a-day; was kept entirely on barley-water, during that time, under the influence of an occasional opiate at night, took, now and then, small doses of magnesia, or used enemata, had her diet gradually increased; on the twenty-fifth day after the operation, was enabled to sit up,— the wound, with exception of a single spot, the size of a pea, being entirely cicatrized—and, finally recovered, and now enjoys, together with her child, perfect health.

A second time has it fallen to my lot to perform Cæsarean section upon the individual whose case has just been detailed, and with the same fortunate result, as the following particulars will show.

Sunday, Nov. 5th, 1837, eight o'clock A. M., Dr. George Fox called upon me, and requested a consultation with himself and Dr. Meigs in case of Mrs. R. Dr. Fox also stated that Mrs. R. had only been seized with labour-pains about six o'clock of the same morning, although the membranes had been ruptured two days before.

At nine o'clock, A. M., I met in consultation, Drs. Meigs, Hodge, and Fox, and it having been decided that the child was alive, and that under all circumstances, it would be better to perform Cæsarean section than embryotomy, the consent of the patient being also obtained, Dr. Fox requested me to undertake the operation. Every arrangement having been made, with as little delay as possible, the patient was placed on her back upon a table covered with a mattress, when, assisted by the above gentlemen, and by Drs. George W. Norris and Charles Bell Gibson, I made an incision through the integuments, about an inch and a half below the umbilicus, and extended it five inches and a half towards the pubes, through the original cicatrix. The tendons of the external oblique appeared to have been converted into condensed cellular tissue, and the adhesions of the superjacent integuments to them were very perfect. Penetrating, cautiously, through the cicatrix, the peritoneum, which seemed to adhere to the surface of the uterus for four inches, was divided, and the uterus, itself, opened to the extent of five or six inches,

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* After the operation the patient was kindly visited, repeatedly, by Drs. Dewees, William Coxe, Horner, Spackman, and others.

its walls towards the fundus, for an inch and a half, being half an inch thick, but towards the neck not more than the eighth of an inch. These walls were divided chiefly by the bistoury, guided by the directory. At the upper and lower corners of the incision the peritoneum was necessarily cut through, about three-quarters of an inch at each place, and through each of these openings an intestine protruded slightly, but was easily kept back by the fingers of Dr. Fox. Only a single artery appeared that seemed to require the ligature; and this in one of the thick edges of the uterus. It soon shrunk, however, and could not afterwards be found. As soon as the uterus was fairly divided, I requested Dr. Meigs to rupture the membranes, and take out the child. This was accordingly done, with the utmost dexterity, by first removing the left arm and leg and afterwards the body and head; after which, the placenta was taken away. The edges of the uterus were then pressed together, with the fingers, and the whole of the organ was distinctly seen to contract in a few seconds. The hemorrhage, at first considerable, soon ceased. The integuments being drawn together by six tacks of the interrupted suture, were supported by adhesive straps, compresses and bandages, and afterwards by general compression over the abdomen. The patient was permitted to remain on the table in the position she was in during the operation. She expressed herself comfortable, and only complained about fifteen minutes after the operation, of slight nausea and flatulency, to relieve which, she took an anodyne and a little lime-water.

Three and a half, P. M., met Drs. Meigs and Fox, and found the patient very easy and quiet, had slept comfortably, and pulse nearly natural.

Nov. 6th, half-past ten o'clock, A. M., met Drs. Meigs and Fox, patient passed a restless night—but does not complain this morning of any thing. Pulse eighty-five. Loosened the bandage, and found the parts had undergone no change. Belly distended with flatus, but no pain or uneasiness upon pressure—ordered bicarbonate of potash and morphia.

Nov. the 7th, half-past ten o'clock, A. M., met Drs. Meigs and Fox. Patient passed a good night, pulse seventy-eight, no thirst, no uneasiness of any kind—abdomen soft, although last night tumid with flatus which was instantly discharged in large

quantity by the stomach tube per rectum. Slept well without opium.

Nov. the 8*th*, half past ten o'clock, A. M., Drs. Meigs, Fox, and Hodge present. Breasts of patient gradually swelling and some increase of pulse, probably from this cause—pulse one hundred,—abdomen still soft, and not the slightest pain from pressure ; patient removed from table this morning, and placed in bed ; wound beginning to suppurate, and more or less smell from it and from lochia—bowels have not been opened. Has taken freely of the carbonate mixture, and still kept on barley-water ; slept soundly without an opiate. Child not so well to-day, and somewhat reduced, owing to want, perhaps, of a proper nurse.

Nov. 9*th*, patient quite as well to day as yesterday ; pulse ninety-seven ; mixture of carbonate of potash omitted.

Nov. 10*th*, pulse one hundred to-day, but skin soft, almost too much so. Removed adhesive straps, and found wound, for most part, closed except at centre, where an opening of an inch in extent exists, and from this a slight discharge rather sanious. Wound, however, probably not closed by perfect adhesion. Ordered gentle enema. Belly still soft, and every symptom, so far, as favourable as possible.

Nov. 11*th*, pulse ninety-eight ; symptoms very favourable

Nov. 12*th*, dressed the wound, and removed some of the straps ; every thing going on well.

Nov. 13*th*, patient still improving.

Dec. 26*th*, patient perfectly well, and the wound healed, with the exception of a very small fistulous opening.

Feb. 10*th*, 1838, fistulous opening completely closed, and the wound, throughout, firmly cicatrised.

The boy—Cæsar Augustus—in perfect health.

These children, Maria Cæsareana and Cæsar Augustus, are —July 24th, 1841—still living, and enjoy perfect health. The mother has not, since the birth of Cæsar, been pregnant.

On Cæsarean Section, consult Sabatier's Medecine Operatoire ; Simon, in Mem. de l'Acad. de Chirurg. tom. iii. and 5th edit. 12mo.; Baudelocque Traité des Accouchements ; Hull's Defence of Cæsarean Section, 8vo. ; C. Bell, in Med. Chir. Transact. vol. iv. ; I. H. Green, ibid. vol. xii. ; Dictionnaire des Sciences Medi-

cales, tom. xvii.; Plancton, Traité complet de l'Operation Cesarienne, Paris, 1801; Ansiaux's Dissertation sur l'Operation Cesarienne, &c. Paris, 1803; Dewees's Midwifery; Essays, Cases, &c. by the following writers, may be consulted with advantage—Kaiserschnitt, Weinhart, Nettman, Rhode, Wigand, Flammant, Kulenthal, Meyer, Ploderl, Huter, Kittel, Friedemann, Graefe, Bobertag, Wanner, Papius, Davidsohn, Michælis, Siebold; an account of which may be found in Dictionnaire de Medecine, ou repertoire Generale des Sciences Medicales, tom. septieme, p. 156, Paris, 1834; The 7th vol. of Sprengel, Histoire de la Medecine, and Cooper's Surgical Dictionary, may also be referred to. But the most elaborate work ever published on the Cæsarean Section is said to have been written lately by Mansfeldt, a German Surgeon; for an account of which, see Ryan's Manual of Midwifery. Observations on the Cæsarean Operation, accompanied by the Relation of a Case, in which both Mother and child were preserved, (by Professor Gibson,) by Joseph G. Nancrede, M. D., in American Journal of Medical Sciences, No. xxxii. Aug. 1835; Account of a Case of Cæsarean Section, performed by Dr. Gibson, successful in saving, a second time, both Mother and Child by George Fox, M. D., in American Journal of Medical Sciences, No. xliii. May, 1838.

CHAPTER XVIII.

DEFORMITIES.

DEFORMITIES, or distortions of various kinds, may occur in different parts of the body, and arise from numerous causes. They are generally dependent, however, upon malformation, or disease of the joints; upon contraction or relaxation of muscles or tendons; upon injuries; upon general debility and other constitutional affections; upon the indulgence in awkward habits, or unnatural attitudes; upon artificial contrivances and capricious and injurious modes of dress. Thus from white swellings or caries of the joints, complete or incomplete anchylosis and deformity may arise; from carelessness and tight lacing,* cur-

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* The following case, well calculated to show the effect of tight lacing, was obligingly communicated to me, a short time ago, by my intelligent friend, Dr. Isaac Thomas, of West Chester.

" Miss ———— ————, aged about seventeen years, had been suffering for several months from paroxysms of violent palpitation of the heart and oppressed respiration, coming on at intervals, of various duration, the intervals being occasionally of several weeks, and at other times much shorter. On the evening of the 21st of May last, she was suddenly seized with a similar paroxysm, which continued during the night, and early in the morning following, Dr. P. S. Conner was called to see her. He found her in a drowsy state somewhat resembling stupor, with violent palpitation of the heart, which caused the ribs to bound under the hand when laid upon them, and was perceptible to the eye. The face was somewhat flushed, pulse frequent, not strong nor full, it soon, however, diminished in frequency and force, and sank so low as to require the use of stimulants, although some of the earlier symptoms indicated the use of the lancet, which was not resorted to. On former occasions, after a paroxysm had subsided, she would have spells approaching to syncope, and was restored by the use of mild stimulants, and under the same treatment rallied a little on the present occasion, for a short period, but death closed the scene about one o'clock in the afternoon. On the following day I assisted Doctors Worthington and Conner, in making a post obit examination. We found the chest very much contracted, evidently caused by tight lacing; so much so, indeed, that the cartilages of the lower ribs, on the opposite sides, were brought

vatures of the spine; *round* shoulders, as they are called, from the habit acquired by children of throwing their arms forwards, and supporting them on the front of the chest; elevation of one shoulder or depression of the other, by the habit of leaning to one side in the act of writing, reading, or drawing, or whilst engaged in needle work, or various sedentary employments. Again, the joints of the hip and knee may be deformed. The latter is most frequent, and the distortion either inwards or outwards. In the former case the patient is said to be *knock-kneed* —in the latter, *bow-legged*. Some of these affections have been already noticed, and others remain to be considered. These are ruptures of muscular fibres or tendons, contractions of fingers, toes, and other joints, and that affection—commonly congenital —known by the name of club foot.

SECTION I.

RUPTURE OF TENDO ACHILLIS.

RUPTURE of muscular fibres may take place from violent exertions in any part of the body; but the biceps flexor cubiti, and extensors of the leg are most apt to suffer. The gastrocnemius, especially, is very apt to be torn in persons unaccustomed

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nearly in contact for a space of four inches below the ensiform cartilage, and carried downwards so as to nearly approach the crista of the ilia on each side. The liver was much larger than natural, occupying the natural situation of the stomach, the great curvature of which rested in the left iliac fossa. The lumbar vertebræ advanced forward so as to nearly approach the anterior parietes of the abdomen, and the intestines were chiefly contained in the cavity of the pelvis. There was no very evident disease of the contents of the abdomen, except, as I have observed, of the liver and the mucous coat of the stomach, which presented an appearance of too much redness to be altogether healthy. The heart was somewhat increased in size, and the right auricle contained a mass of what appeared to be indurated coagulable lymph, of the size of a pheasant's egg flattened, resembling adipose matter very much in appearance, attached by a pedicle to the septum, between the auricle and right ventricle. The right ventricle also contained a mass of the same kind of substance, three or four inches in length, which extended into the pulmonary arteries, and consequently prevented the valves from closing. There was congestion of the lungs; on the left side the lower lobe appeared in a hepatised condition, but our time was too limited to make a full examination of them."

to much exercise, as in middle-aged, or old people, who, for-
getting themselves, sometimes aim at sudden feats of agility by
capering with young partners at a dance, or attempting to cut
pigeon-wing, or to perform similar inappropriate exploits. Some-
times, however, muscular fibres are torn by very slight efforts,
both in young and old subjects. The accident is almost un-
known among rope-dancers, circus-riders, posture-makers, and
persons engaged in similar occupations.

But of these different accidents, rupture of the tendo Achillis
is the most frequent. It may be known by the loud snap, or
report, which instantaneously follows the rupture ; by the patient,
generally, falling to the ground, and being unable to rise without
assistance ; and when up, finding it difficult to walk or stand ;
by the retraction of the belly of the muscle upon the leg ; and
by the space, or wide separation, between it and the torn ten-
don ; into which chasm the integuments can be pressed without
difficulty, so as to leave a very sensible and obvious depression
externally. Sometimes instead of a snap being heard, the pa-
tient has experienced the sensation of a smart rap on the leg
from a rattan or stick. In Dr. Monro's case the symptoms were
peculiar—a loud crack being first heard, as if he had crushed a
nut with his heel, followed by a sensation of the shoe having
perforated the floor. Division of the tendo Achillis by a cutting
instrument will necessarily give rise to the same symptoms,—
with exception of the absence of snap or report. A few cases
of this latter accident I have met with among workmen—gene-
rally produced by stepping upon the edge of a drawing-knife or
corner of an adze, accidentally projecting among shavings on
the floor of their shop.

TREATMENT OF RUPTURE OF TENDO ACHILLIS.

Laceration of the fibres of the gastrocnemius, or other mus-
cles, should be treated by rest, position, and bandages,—the limb
being so placed as to take off strain from the affected part.
There are various modes of managing the ruptured tendo Achil-
lis, all founded upon the same principle, differing only from each
other in being more or less simple or complicated. Desault's
plan was to bend the thigh on the pelvis, the leg on the thigh,

and to *extend* the foot on the leg ; and having in this way brought the ends of the ruptured tendon in contact, to retain them there by filling up the hollows on each side of the tendon with lint and compresses, fixing a bandage on the sole of the foot carrying it upwards over the back of the leg and thigh, and encircling the whole limb from the toes to the groin by a roller, calculated by pressure to subdue muscular action, and prevent the limb from being moved from the position in which it was first placed. On its way up the leg the roller was also made to pass, by several turns in the form of the figure 8, around the ruptured part. After the lapse of several weeks the bandages were removed, and the patient allowed very cautiously to use passive motion. Monro primus, who ruptured his own tendo Achillis, employed a more complicated apparatus, consisting of a sock or slipper, with a strap attached to its heel, to be fastened upon the leg to keep it steady. The limb was surrounded by flannels, and constantly fumigated with benzoin. Five months elapsed before he could use the limb freely. John Hunter met with a similar accident ; and I have known many city practitioners to lacerate the fibres of their gastrocnemii—owing, no doubt, in part, to their riding so constantly, and unnecessarily, in carriages, so that when suddenly called out and obliged to stir their stumps vigorously, by walking an unwonted distance, their unpractised muscles are easily torn. Tendons, like other fibrous textures, when torn, are repaired slowly, and through the medium of a new-formed substance approaching to cellular tissue. In 1827, Dr. Richard L. Fearn,* of Alabama, published an inaugural essay in our university, detailing the results of interesting experiments on tendons. His statements have since been confirmed by other experimenters.

* See Philadelphia Journal of Medical Sciences, for 1827.

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SECTION II.

CONTRACTED TENDONS.

THE ham-string tendons, in one or both limbs, from rheumatism, burns, inflammation about the knee, diseases and injuries of the leg, and many other causes, are often so contracted, as to lame the patient, oblige him to use crutches, or confine him to bed. From similar causes, the foot may be unnaturally extended, or bent, and great distortion thereby ensue. The same may be said of the elbow and wrist joints. The amount of inconvenience and injury, however, in such cases, is comparatively inconsiderable, inasmuch as these joints, when flexed, are still very useful to the patient; but, on the contrary, if rigidly extended, would prove almost as inconvenient as a flexed leg.

But contraction of the fingers and toes, with corresponding deformity of the hand and foot, is much more common than any similar affection in other parts of the body. Sailors and riggers, from handling ropes, and sustaining the body by the hands, or from pressure on the soles of the feet, and toes, whilst balancing themselves aloft; smiths and other workmen, accustomed to hold rough, hard, or hot bodies, are peculiarly liable to have the aponeuroses and tendons contracted, and the skin covering them condensed and indurated in greater or less degree. Ship's companies, during long voyages, and where the weather for weeks, or months, has been tempestuous, and each man obliged to do double duty, may all suffer simultaneously.

Surgeons had long been accustomed to treat such affections, but it remained for the celebrated Dupuytren to explain the true nature of them. He selected a deformed hand, had a drawing made of it, dissected off the integuments from the palm and the internal surface of the fingers. Still the deformity remained. He then laid bare the palmar fascia, found it tense, shortened and thickened, bands or cords going off from its lower part to the sides of the affected fingers, which upon being

straightened, put the fascia upon the stretch. Upon dividing these prolongations, or bands, running to the fingers, the deformity instantly disappeared—showing, evidently, that it depended upon inordinate tenseness of the palmar aponeurosis. Similar views were entertained by the late Mr. Henry Cline.

The appearances presented by this disease, when the hand is the seat of it, are pretty uniform. The ring-finger is the one most frequently affected, the contraction first manifesting itself in the carpal phalanx. The adjoining fingers, and their corresponding carpal phalanges, are next affected, and subsequently the whole range. Folds are next perceived in the skin, the concavities of which look towards the fingers and the convexities towards the wrist. These gradually become thicker and thicker, and seem to keep pace, in their enlargement, with the contraction of the ring-finger. Cords at last seem to extend from one part of the palm to the other, and thence to the different fingers, most of which are, at last, bent like the talons of a bird, preventing the patient from grasping bodies of any size, without severe pain, and rendering the fingers incapable of extension, even when heavy weights are appended to them, or inordinate force applied. Similar affections of the aponeurosis and tendons of the foot, may give rise to deformities resembling some of the varieties of club-foot.

TREATMENT OF CONTRACTED TENDONS.

Much more may be done by appropriate machinery, or well contrived apparatus, in cases of contracted tendons than is commonly imagined. Few physicians or surgeons, however, have natural ingenuity enough, or sufficient leisure, occupied as they are, with other weighty and diversified professional avocations, to devote sufficient time to the subject to insure success. Hence such affections are too often entrusted to the instrument-maker or mechanic alone, who, from want of anatomical and pathological knowledge, is frequently as ignorant and inefficient as his own machine. It is, fortunate, therefore, that such things are now beginning to be understood, and that surgeons have been found willing to descend from their dignified and high positions, and take up matters, formerly considered unworthy

their attention. In all parts of Europe such scientific men
have recently made their appearance, and Americans of simi-
lar stamp are beginning to show themselves in the same field,
and in our large cities, at least, meet with encouragement. In
Philadelphia especially, Dr. Heber Chase, so well known for
his efforts for the last few years to improve the form of trusses,
and to effect, as far as possible, the radical cure of hernia, has
recently devoted additional attention to the invention of appa-
ratus well calculated to remove many cases of deformity pre-
viously considered incurable, and with a success,—for which,
from personal knowledge, I can vouch,—by no means inconsi-
derable. It would be impossible for me, in a work of this de-
scription, to enter into details respecting the various forms of
apparatus employed by him for different varieties of distortions,
I shall, therefore, merely refer to his papers on the subject in
the American Journal of Medical Sciences and other periodi-
cals of the day—barely adding, that from personal inspection of
many of his cases, I have reason to believe that he can accom-
plish all he promises.

When mechanical contrivances fail to overcome the difficul-
ties the surgeon has to contend against in contracted tendons,
an operation may be resorted to—division of these tendons. In
former times a good deal was done in this way. Whilst a stu-
dent, I was requested by a family to examine the corpse of a
man for whom a coffin could not be made, owing to his ham-
strings being so contracted from long-standing ulcers of the leg,
as to cause the legs to stand off at right angles from the thighs.
I took a sharp penknife and divided the cords, and by a very
slight effort restored the limbs to their natural position. This
case made a strong impression upon me, and caused me after-
wards to apply the same practice to the living body, and in
several instances with not less striking effect. Recently the
same operation has been making a noise in London, and Mr.
Benjamin Philips is considered, I believe, entitled to the credit
of originating it! If investigated, I dare say it would turn out
to belong to neither of us, but to some honest, old-fashioned
surgeon, whose exploits in this way have been buried for ages
in some musty folio, or thick, fat, ill-shaped quarto. But be this
as it may, the operation will prove not the less useful, and may
be had recourse to upon various occasions, and in various

situations, after attempts by machinery have failed, or to facili-
tate such attempts by saving time, or the patient, long-con-
tinued pressure or extension. It must be understood, however,
that after such operations have been performed a cure is sel-
dom effected, unless followed up, for weeks, in some instances,
by well regulated mechanical means. Latterly, Guerin, the
celebrated editor of the Gazette Medicale, has applied the prin-
ciple of division of tendons to removal of lateral curvatures of
the spine, and many cases, both in private practice and at his
Orthopedic Institution, near the Bois Boulogne, attest the suc-
cess which has crowned his efforts—conjoined, as they are, with
pure science and consummate mechanical skill.

For the relief of contracted fingers, arising from shortening
and condensation of the palmar aponeurosis, Dupuytren makes
a transverse incision about ten lines in length over the meta-
carpo-phalangeal joint of the ring-finger, through the integu-
ments and palmar fascia, dividing, at the same time, any pro-
longations that may extend to the fingers. By pursuing this
course, he has met with almost invariable success, where other
surgeons, who have confined their efforts to division of the ten-
dons, or extirpation of the folds of skin, have as uniformly
failed. For the cure of contracted tendons in the foot, the same
plan must be pursued. When the toes overlap or project unna-
turally from contraction or extension of tendons, from wearing
tight shoes or boots, or from natural tendency to such com-
plaints, the plan—originally suggested and executed by Boyer
—division of the tendons by a narrow knife or couching needle,
must be pursued, instead of amputating these members. After
all these operations, well adapted splints and bandages must be
applied, and worn until the deformity is removed ; and it should
never be forgotten, that upon these, more than the operation, the
cure is dependent.

SECTION III.

CLUB-FOOT.[*]

THE term club-foot, is intended to apply to certain deformities of the foot, met with at various ages; and frequently very distinct in themselves. It is either congenital, or accidental. Writers have long attempted to account for its appearance in the congenital form, but, so far, not satisfactorily. A bad position of the feet, in utero, seems to be the most plausible solution of the question. The accidental form of club-foot, occurs from various causes—fractures, luxations, sprains, ulcers and partial paralysis.

VARIETIES.

Writers have, for the most part, admitted three varieties of club-foot, although we may, perhaps with propriety, question the correctness of the terms employed to designate them.

The first variety, *pes equinus*, from its supposed resemblance to the foot of a horse, is that in which the patient can only walk or stand upon the toes, or metatarso-phalangeal articulation. The second variety, *varus*, in which the patient rests on the outside, or the outer portion of the dorsum of the foot. The third variety, *valgus*, in which the inside of the foot is used.

To these, some authors have added a fourth and fifth. The fourth variety, is that in which the forepart of the foot being thrown under the axis of the leg, the toes and a part of the metatarsal bones turn under the heel, in such a manner, that the dorsal face of the cuboid and cuneiform bones serves as a point of support to the patient. This variety is called *phalangeal*. The fifth is that in which the dorsum of the foot is applied against the anterior face of the leg, internally and externally, the heel being directed downwards. This is called *talus*.

Club-foot, as before remarked, may be congenital or acquired.

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[*] This section is by Charles Bell Gibson, M. D., of Baltimore.

The latter may appear at any period of life. The most common cases, are, probably, those presenting a combination of varus and pes equinus.

Cases of valgus are rare, and those constituting the fourth and fifth varieties very uncommon.

OF PES EQUINUS.

Pes equinus exists in different degrees, from the simple eleva-tion of the heel, to the entire extension of the foot. There may be various shades of deformity between these two points. The subject of pes equinus usually rests upon the inferior face of the metatarso-phalangeal articulations and the toes, but these seldom receive the whole weight of the body in a uniform manner; for the deviation is frequently a little complicated with inversion, or eversion: if with inversion, the resting point will be furnished principally by the three last metatarso-phalan-geal articulations, and the corresponding toes; if, on the con-trary, it be complicated with eversion, the two first toes and their articulations, with the metatarsus, will bear the weight of the body.

These secondary deviations inwards, or outwards, may depend upon the laxity of the internal or external ligaments of the tibio-tarsal articulation, or upon a deficiency of antagonist power between the muscles of the inside and the outside of the leg.

The elevation of the heel, in pes equinus, is always in propor-tion to the shortening of the muscles of the calf. The deformity is very slight, when the heel is raised but an inch or two from the ground; and if at the same time the gait is slow, and the shoe well made, it is scarcely observable. When, on the con-trary, the muscles of the calf are much shortened, the heel is so much raised, that the forepart of the foot occupies a point posterior to the axis of the leg, and the deformity is so great that it cannot be concealed; the toes and metatarso-phalangeal articulations are separated so as to increase the base of support a third or a fourth. The sole of the foot becomes extremely concave.

In old subjects there is often more or less flexion of the leg on the thigh: this flexion is owing to the shortening of

the biceps, semi-tendinosus and semi-membranosus, which is
the natural consequence of the increased length given to the
limb, by the great extension of the foot.   In order to walk, the
patient carries the knee forcibly forward, and seems to conceal
the leg under him.   When congenital, pes equinus is not com-
monly a great deformity.   The greatest degree of distortion is
observed in accidental or acquired cases, and particularly after
paralysis.   Then, in fact, the general weakness of the limb per-
mits the strongest muscles, which are also the most disposed to
contract, to draw the foot towards them.   These muscles being
always those of the posterior part of the leg, it results that the
heel is more or less drawn up.   Finally, the weight of the body
assisting the action of the muscles on the inner side of the leg,
a complication of the deformity occurs called equin varus,
which is, as has been before observed, the most frequent form
of club-foot.

If, instead of the tibial muscles, the peroneal should be con-
tracted, it is evident that an eversion of the foot must take place,
and the case would then be equin valgus and not equin varus;
but this, for the reason already given,—the predominance of the
inner over the outer muscles,—rarely occurs.

In pes equinus the tibio-fibular cavity ceases to cover entirely
the articular face of the astragalus.   If the case be a slight one,
this face is covered by one half or two-thirds of the cavity;
if the deformity is very great, the cavity rests only on the pos-
terior surface of the astragalus, the rest of its surface being
applied to the upper and posterior face of the os calcis.

According to the degree of deformity, the seven bones of the
tarsus are more or less separated from each other at their upper
surfaces, and this separation determines the amount of convexity
of the dorsum, and the corresponding concavity of the sole.   The
tarso-metatarsal articulations are separated in the same way.
The deformity in this variety seems to be caused by the pres-
sure of the tibio-fibular cavity on the posterior part of the astra-
galus, which it forces forward, the leg taking a twist inwards
or outwards, according as the foot is directed inwards or out-
wards.   The articular face of the astragalus is often made to
project above the upper surface of the scaphoid.   The bones
of the second row of the tarsus are likewise changed in their
relations ; their posterior face becomes superior, and their supe-

rior face becomes anterior. To the greater developement of the dorsal face of the bones of the tarsus is almost always joined a twist of these bones on their lesser axis, either inwards or outwards. In consequence of this change, the bones of the metatarsus must also be changed in their direction and relations. In fact, the last two metatarsal bones and the toes with which they articulate are often on the same line, and appear as long as the first three, on account of the prolongation forwards of the cuboid. So that, as has been remarked, the patient affected with pes equinus is supported by the inferior face of the metatarso-phalangeal articulations and by the toes.

These articulations, loaded with an enormous weight, separate from each other, and increase very much in volume, on account of the irritation to which they are subject in standing and walking. When the deformity is very great, the first phalanges of the toes seem to articulate with the superior part of the anterior extremities of the metatarsal bones, so that when the patient puts the foot to the ground, the metatarsus and the toes describe more or less of a right angle. In this variety of club-foot, the ligaments of the upper surface of the foot are elongated and relaxed, and those of the lower or plantar surface are shortened, and made tense : if, at the same time, the foot is turned inwards, the ligaments are contracted towards this side, and relaxed on the other, and *vice versa*. The muscles of the whole of the deformed limb, and particularly those of the leg, are diminished; this is also the case with the bones, vessels, and nerves, and is in proportion to the age and degree of the deformity. The fleshy part of the muscles of the calf, much reduced in size, seems displaced and mounted upon the top of the leg near the knee. The muscles of the anterior part of the leg, and those of the superior part of the foot, are elongated and relaxed, whilst, at the posterior part, we observe the same contraction as at the plantar surface.

The centre of gravity, when the patient is standing upon the deformed foot, answers, ordinarily, to the anterior third of the foot towards the metatarso-phalangeal articulations, whilst in the sound state it answer to the posterior third. Progression is excessively interfered with, and the patient walks as if the foot were anchylosed with the leg. The deformed foot is almost always put before the other.

Varus is that variety of club-foot most frequently met with in new-born children. As has already been stated, it is rarely met with in its simple state, being almost always more or less complicated with pes equinus. Like pes equinus, it appears under an infinite variety of shades, from the slight inclination inwards, to the complete turn of the foot on itself. However trifling this deformity may appear before the infant is able to walk, the first attempts at progression very soon develope serious difficulties. Then the point of the foot is directed downwards and inwards, whilst the twist of the os calcis carries the heel upwards and inwards. The gastrocnemius and soleus muscles, the plantars, the tibials, the long flexor of the toes, and the flexor of the great toe, become hard, resist pressure, and finally appear contracted. The peronei muscles, on the contrary, relax and become weak in proportion to the unnatural tension of those just named; they are incapable of opposing their more powerful antagonists. In consequence of this want of antagonist power, the points of insertion of the muscles are displaced : those of the anterior and external muscles recede from each other, those of the posterior and internal approach each other. The anterior tibial and the muscles forming the tendo Achillis are most changed, and this change is in more direct proportion with the general progress of the deformity than that of any other muscles.

The extensor proprius muscle of the great toe almost always undergoes the same change, and often even to the extent of throwing the toe half over upon the first metatarsal bone.

The ligaments, like the muscles, are firm and contracted on the sole of the foot and on its inner border, but loose and yielding on the dorsal surface and on the outer border. This general defect in equilibrium tends considerably to increase the deformity, particularly if patients continue to walk as they increase in age. In proportion as the affection becomes more grave, the ligaments that unite the leg with the foot, and the tarsal bones between them enter into a condition of action more and more unequal. Those which go from the external malleolus to the foot are lengthened, and fall into a state of semi-atrophy, whilst the reverse is the case with those going to the internal malleolus.

All the bones of the foot suffer a marked displacement—,a sort of twisting on their lesser axes. This twist commences with the os calcis, the cuboid, and the scaphoid ; the cuneiform bones are then involved, and finally the metatarsal bones and the phalanges.

The os calcis inclining outwards, presents its posterior tuberosity inwards and upwards, and its anterior tuberosity outwards and downwards. Its anterior tuberosity is in part abandoned by the cuboid on account of the torsion of the latter on its lesser axis. Between these two bones an unnatural depression exists, which the lengthened ligaments partly cover, and it is this mutual separation of the cuboid and anterior tuberosity of the os calcis that produces the convexity of the outer border of the foot. The scaphoid bone receives but the inferior and internal part of the articular head of the astragalus, being turned from without inwards in such a manner that its internal protuberance appears situated immediately below the natural malleolus, and its external protuberance directed downwards towards the sole of the foot. It is to this displacement of the scaphoid, and to its twist, that we attribute the angle observed at the inner border of the foot near the internal malleolus, and the same displacement causes the projection of the scaphoid articular face of the astragalus towards the dorsal surface of the foot. It is easily seen that the great changes of relation between the bones just named, must carry with them similar derangements of the cuneiform bones of the metatarsus and phalanges.

In general, as has been remarked by Scarpa, the astragalus suffers the least displacement in varus of infants, particularly if they have never walked, or if the foot has been confined in a suitable instrument : but with adults, or children in whom the foot has not been confined, we sometimes see the astragalus pushed forwards from its articulation with the tibia, and a little outwards from the os calcis, thus enabling its tibial articular face to be easily felt under the skin in advance of the external malleolus. In this state of things, that part of the os calcis situated between the tendo Achillis and the astragalus, and more or less of the internal face of the same bone are received into the cavity of the tibia intended for the astragalus. From this strange arrangement result the flattening and shortening of the heel.

Other cases of varus have been observed in which the mus-cles of the calf of the leg were not shortened, and in which,

although the foot was strongly turned inwards, the patient kept himself upright and walked on the heel, which, by the way, was much enlarged. In cases of this kind the os calcis is very little twisted; the principal cause of the deformity is in the sinking of the internal border of the tibial articular face of the astragalus; in the contraction of the tibial muscles, anterior and posterior; of the short flexor of the toes, and of the adductor muscle of the great toe. The scaphoid and cuboid bones are directed inwards without being strongly turned on their lesser axis; the three cuneiform follow the movements of the scaphoid and cuboid, and are like them directed inwards. The metatarsals and pha-langes are also changed in their relations, in consequence of the displacement of the second row of tarsal bones. The plantar surface of the foot is very concave, as it would necessarily be from the tension and shortening of the muscles of this part of the plantar aponeurosis.

Notwithstanding the various derangements to which the feet of patients affected with varus are subject, it is still certain that their texture and configuration are not always sensibly altered, especially in young subjects. Owing to the repugnance which patients naturally have to the exercise of the affected limb, long and frequent intermissions occur in the reciprocal action of the bones on each other, and luxation and deformity are thereby delayed and interrupted. Where the deformity is not very great, patients support themselves tolerably well on a portion of the external border of the plantar surface, but when the torsion becomes extreme, they no longer find a support in the plantar surface; they seek it in the middle of the outer border, or in the external third or half of the dorsal face, all the forepart of the foot being turned completely inwards.

With other patients, the point of support is merely a large callosity covering the anterior tuberosity of the os calcis, the dorsal face of the cuboid and the interval between the cuboid and the os calcis. This callosity has the appearance of a true heel.

Other patients, again, have their support in the base of the posterior tuberosity of the fifth metatarsal bone.

The articular head of the astragalus abandoned by the sca-phoid, the anterior tuberosity of the os calcis, and the cuboid bone, furnish to certain others a sort of tripod, for support, sufficiently large and solid.

In all cases of varus, the external malleolus is placed lower and more behind than in the natural state; it almost touches the ground, whilst the internal malleolus, pushed more forwards, is no longer visible. The point of the foot is almost always carried upwards, and very much inwards; sometimes the great toe seems almost to touch the leg. The dorsal face is extremely convex, and the sole proportionally concave, and deeply furrowed. The heel is so raised and directed inwards, that in many subjects it appears not to exist at all. The skin covering the dorsum of the foot, and its external margin, is studded with callosities, which impart a hideous aspect to the foot, especially on the elevations made by the bones. The limb is, in general, less developed than in the sound state; the muscles are shrunken, and yellow; the tendons longer, more delicate, and surrounded by a greasy cellular tissue. The tendo Achillis, has, in some cases, half the length of the muscles from which it comes; its size diminishes as the deformity increases, probably on account of the inertia which pervades the whole muscular apparatus of the limb.

With the exception of the anterior tibial muscle, which is always the last to lose its size and colour, and some occasional nerves which have preserved themselves amid such general decay, all the constituent parts of the deformed limb, muscles, tendons, ligaments, vessels, nerves, even to the bones themselves, fall, sooner or later, into a puny and miserable condition; which may, perhaps, be in a great degree attributed to the inefficient means of exercise left by the deformity to its victim. In double varus, especially, the effort to walk is extremely painful: the patient is obliged to raise each foot as if it were anchylosed, and to pass one over the other. The centre of gravity varies according to the degree of deformity; always, however, being posterior to the external malleolus, making each step vacillating and insecure, and exposing the patient to continual falls.

OF VALGUS.

The third variety of club-foot, called by the ancients, valgus, is much less common than the preceding varieties, especially in the congenital state. When congenital, the form in which it is

ordinarily seen is the following. The foot is thrown strongly
outwards, touches the ground only by the anterior half of its
internal border, and rests principally on the first metatarsal bone
and the great toe. There is always a separation between the
surfaces of the first metatarsal and of the internal cuneiform
bone. Sometimes the scaphoid and internal cuneiform, and the
scaphoid and head of the astragalus articulating with it, undergo
a similar derangement in their relations to each other. It is not
impossible to meet with these three different irregularities in the
same foot. The outer edge of the tibial articular surface of the
astragalus, and the corresponding side of the same bone, is all
that is received into the tibio-fibular articular cavity.

The posterior tuberosity of the os calcis is directed outwards,
and its anterior tuberosity inwards and towards the sole of the
foot. The tendo Achillis is often, and the peronei muscles are
always shortened. The inner border of the foot is convex,   an
seems to start from the internal malleolus, which has become
much more prominent than usual; the outer border of the foot,
on the contrary, is concave, and the centre of the concavity
answers to the calcaneo-cuboid articulation. The sole of the
foot is often apparently hollowed out, and numerous deep
wrinkles cover it in all directions.

We sometimes meet with cases of valgus, in which the foot
is not deformed, but merely directed outwards, without material
shortening of the muscles of the calf. The peronei muscles
alone, in these cases, are in fault; for not having the necessary
length, they communicate movements of rotation and torsion to
the articular head of the astragalus in the tibio-fibular cavity.

In this variety of club-foot, it is evident that the ligaments
corresponding with the inner border of the foot will be relaxed,
and their antagonists made tense.

Consecutive or secondary valgus is much more common than
the congenital form of the disease. It is occasionally met with
in one foot, whilst varus exists in the other. In very many
cases it commences with slight pes equinus. Patients in walk-
ing and leaning upon the inner border rather than on the outer
border of the foot, put the tibial muscles in a forced state of
extension, and the peronei muscles in a corresponding state of
contraction:—the result of this double action is the rapid pro-
duction of valgus.

OF PHALANGEAL CLUB-FOOT.

The fourth or phalangeal variety of club-foot is extremely rare—but, like the others, has its different degrees of deformity. In its first degree, the foot is rather doubled under the sole than broken in two. The point of support is the dorsal face of the toes and the metatarso-phalangeal articulations; the metatarsal bones are directed obliquely, from above downwards, and from before backwards; the heel is situated very high, and transverse deep wrinkles cover the sole of the foot. We meet with this form of the fourth variety only in children who have walked but little; as the patient gets older, his body becoming heavier, the flexion of the foot backwards increases, so as to produce a second and a third degree.

In the second degree, the deviation of the foot commences between the metatarsal bones and the second row of tarsal bones; the metatarsals, bent at a right angle under the tarsus, serve as the point of support; the toes are sometimes gathered up under the heel. This semi-luxation of the metatarsal bones below and behind the second row of tarsal bones, forces the anterior face of the cuneiform and cuboid bones to become inferior, and often obliges them to assist the dorsal face of the metatarsal bones in forming a point of support for the patient.

In the third degree, we find the foot broken, as it were, between the first and second row of tarsal bones, with a sort of luxation of the scaphoid and cuboid below and behind the scaphoid articular head of the astragalus and the anterior tuberosity of the os calcis. The point of support is the dorsal face of the second row of tarsal bones, on the anterior eminences of the astragalus and os calcis—now become inferior. The metatarsal bones and the toes, relieved from all contact with the ground, are folded under the heel, and pass considerably beyond it.

Whether this variety of club-foot be congenital or accidental, it is owing to the same causes,—to the shortening of the muscles of the calf, of the long and short flexors of the toes, of the plantar aponeurosis, and of almost all the ligaments of the sole of the foot.

The fifth variety of club-foot, talus, is still more rarely met with than the last. In it the foot presents its dorsal surface against the anterior region,—internal or external,—of the leg. The toes are directed upwards the heel downwards, the sole forwards, and inwards or outwards. The extensor muscles of the toes, the tibialis anticus, and the peronei muscles are shortened. When we attempt to remove the foot from the leg, to give it a more natural position, a powerful resistance is experienced. If the dorsum of the foot answers to the anterior and internal face of the leg, the extensors, the tibials are more contracted than the peronei muscles; the reverse is the case if the back of the foot is against the external face of the leg. In general, the foot is very little deformed in this variety. The tibio-fibular cavity contains but the anterior edge of the astragalus; all the rest of the superior face of this bone is carried to the back of the leg at the anterior part of the tendo Achillis. The os calcis, situated vertically, touches the ground by its posterior tuberosity.

TREATMENT OF CLUB-FOOT.

With regard to the treatment of club-foot, at the present day, there seems to be considerable difference of opinion among surgeons. Within the last few years, it has become the fashion to divide some one or more of the tendons belonging to the foot, most generally the tendo Achillis, on account of the influence their contraction is thought to exert upon the various deformities: accordingly we find, perhaps, the majority of surgeons in favour of this operation; and there is no question, that extreme cases of the disease, have been improved by it, and the subsequent employment of apparatus. But it is questionable, how much of the benefit is attributable to the section of the tendon, and how much to the power of the apparatus. I am inclined to believe, that in very many cases, the section is unnecessary, if not absolutely injurious, and that the employment of apparatus alone, is a competent means of cure. We find in

the works of Hippocrates, an account of club-foot, with also very simple and excellent precepts for its treatment,—by means of bandages, frictions, and a shoe. His principle was to proceed with gentleness, endeavouring to restore the foot to its natural conformation, by careful and long-continued pressure in the proper direction. His successors paid very little attention to the subject; and, until the appearance of Scarpa's memoir, in 1803, there existed no accurate views of the pathology of these deformities, nor any well contrived form of apparatus for their relief. It is true every country was overrun with ignorant pretenders, and quacks, who had each their own peculiar mode of treatment, which was also kept secret, for reasons easily imagined. Among the more respectable of those who treated club-foot, and kept their apparatus secret, were Jackson, in England, and Tiphaine and Verdier, in France. We yet remain ignorant of the means they employed,—for they were buried with them. Before the appearance of Scarpa's memoir and apparatus, a Swiss physician, Venel, invented an instrument, very simple and ingenious, which performed radical cures of very many children, affected with varus and valgus. He also founded an establishment, where his treatment had the same success, and brought patients from all parts of Europe. Scarpa speaks slightingly of Venel's instrument, but his impressions were drawn from an account of it given by Bruckner, which, it would seem, was very deficient and incorrect. Venel's pupil, D'Yvernois, in 1817, published a correct account of this instrument, in his essay on club-foot,—having also, three years previously, submitted it to the examination of a committee of the Société du Ceicle Medicale. This explanation of Venel's instrument by D'Yvernois, placed it very much in advance of any other then in use, and its success in the performance of striking cures gained it considerable reputation. Bruckner and Boyer also invented and made public, instruments, which they conceived to possess improvements upon those then in use. It would be an endless task to describe these various contrivances after the manner of their inventors, and it is even doubtful whether their description would be useful; for the best of them are complicated in comparison with the forms of apparatus in use at the present day. Scarpa's apparatus is so complicated, as to prevent its application very often,

even by the most skilful hands. All that is retained of it, in the instruments now used, is the principle upon which it operates. The mechanical means employed by Dr. Chase, of Philadelphia, in the treatment of club-foot, having, recently, attracted some attention, I here insert a short account of them, drawn up by that gentleman, and obligingly furnished me for the purpose.

" In deformities of the feet, whether there exists an *inversion* or *eversion*, the same principles will apply in their restoration. In *inversion*, whether the foot has advanced to the first, second, or third degree of *varus*, (so called by writers,) the first step towards the restoration consists in bringing the distorted foot into the same axis with the leg. This I accomplished by aid of an instrument which consists of two parts,—a brass splint and steel plate,—which are connected by a soft iron neck, that can be bent by applying considerable force, but will not yield to the power necessary to act upon the foot. The splint is concave, extending from the knee to the malleolus, and when applied, embraces one-third the circumference of the leg. This splint is secured to the leg by straps or rollers. The plate for an adult is one inch in width, two lines in thickness, and extends a distance equal to the interval between the ankle and ends of the toes. In this plate are three fenestræ. When the splint is secured to the leg, to evert the foot, straps are passed through the fenestræ, and thrown around the foot, which is brought as near the plate as possible, without producing pain. These straps are to be drawn from day to day as the foot yields to the action of the instrument. This instrument must be continued in use until the foot is not only brought into the same axis with the leg, but until the toes become partially everted, and all disposition of the foot to return to its deformed state has ceased. In cases of *eversion*, the same instrument must be applied to the inner side of the leg, secured by straps or rollers, as in inversion, and the foot brought inwards by the same mechanical action. The foot being now extended on the leg, the next indication to be fulfilled is to effect the proper flexion in the ankle joint. This I have accomplished by the following instrument.

" It consists of a plate of brass moulded to fit accurately to the back and sides of the leg, which should extend from just below the knee to the ankle : a second piece of brass is formed to act as a sandal or shoe, equal in length, and a little wider than the

foot. These are so attached as to admit of flexion and exten-sion. The leg is secured to the superior part of the instrument, and the foot to the shoe by means of straps and buckles, while flexion is made by two straps extending from that part of the shoe, corresponding with the toes of the patient, to the anterior superior part of the instrument at the knee.

" In that variety of deformity where the patient walks upon the toes, (pes equinus,) the instrument for flexion of the foot alone, is required, unless the foot be partially inverted or evert-ed. Under these circumstances, the instrument for inverted or everted club-foot must first be employed to restore the foot, as directed in the treatment of those cases, after which flexion must follow.

" When the patient walks on the heel, (calcanean club-foot,) and but little force is required to bring the toes to a level with the heel, a shoe so constructed as will throw the weight of the body anterior to the perpendicular line of action of the leg with the foot, is all that is required ; but when considerable force is necessary to bring down the toes, the instrument for producing flexion must be employed, with the straps reversed, in order to extend the instrument."

The treatment of club-foot, by division of one or more of the tendons, supposed to be instrumental in the production of the deformity, is thought to have originated with Thilenius, who performed the operation, successfully, in 1784; though it is said to have been executed, still earlier, by Lorenz, in 1782. He was followed by Michaelis, in 1809, and by Sartorius, in 1812, who, like him, divided the tendo Achillis. Delpech, in 1816, was the next to perform the operation, but he was not as successful as his predecessors, and although convinced of its usefulness, never undertook it a second time.

In 1831, the celebrated Stromeyer performed it, and met with complete success. From that period to the present day, the operation has become more and more established, and is now looked upon as an affair of every day occurrence. In Europe, Dieffenbach, Duval, Bouvier, Roux, Liston, Whipple and Keate, are among the most noted surgeons who have practised the operation ; and in our own country it has been performed very often by physicians as well as surgeons, sometimes with benefit, but, at other times, with most injurious consequences. The

operation itself is extremely simple, when the tendo Achillis is to be divided, and not much less so, when the tibialis-anticus, or the peronei muscles require it.

Certain surgeons prefer to bring down the heel, in the case of division of the tendo Achillis, at once, and retain it in that position, until an union between the divided ends has taken place. Others, again, allow the heel to retain its original position, and endeavour to place the ends of the tendon as nearly as possible in contact, relying upon the extensibility of the connecting medium to bring down the heel, when desired. The treatment of club-foot, after the division of the tendon, is very much the same as that used without such operation, and is simple or complicated, according to the skill, or want of skill, of the surgeon, for no one individual uses exactly the same form of apparatus.

The mode of operation for the division of the tendo Achillis, varies almost as much as the form of apparatus, but among the most simple, would appear to be the following. The surgeon taking a very narrow bistoury, and having an assistant to flex the foot as much as possible, introduces it—an inch or two above the insertion of the tendon into the os calcis,—directly at the anterior face of the tendon. The cutting edge of the instrument is then turned against the tendon, and a gentle sawing motion communicated. The tendon is almost immediately divided, a sensible cracking of its fibres is heard, and the superior portion retires. This operation generally lasts but a few seconds, and is followed by the loss of but a drop or two of blood. When any of the other tendons require cutting, such as the anterior tibial in varus, or the peroneal in valgus, the same plan of operation may be pursued.

THE END.